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LABORATORY CONTRIBUTIONS FROM THE COURSE PREPARATORY TO MEDICINE IN THE UNIVERSITY OF PENNSYLVANIA.

By Prof. J. T. Rothrock, M. D.

Read at the Pharmaceutical Meeting, January 15, 1884.

Mr. Thomas Ridgway Barker, in examining the ordinary liquorice root (*Glycyrrhiza glabra*) finds imbedded in parenchyma and in wood, bundles of bast fibres. These bundles have what may be called a bundle sheath in which are found crystals of calcium oxalate, shown to be such by the ordinary tests.

Figure 1 shows the bundle in the parenchyma, seen in cross section.

Fig. 1.

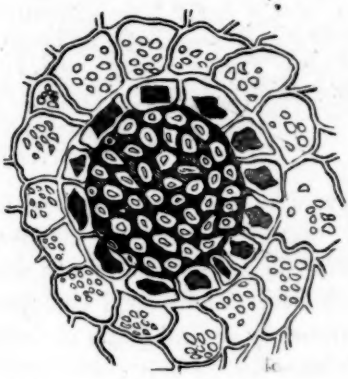


Fig. 2.

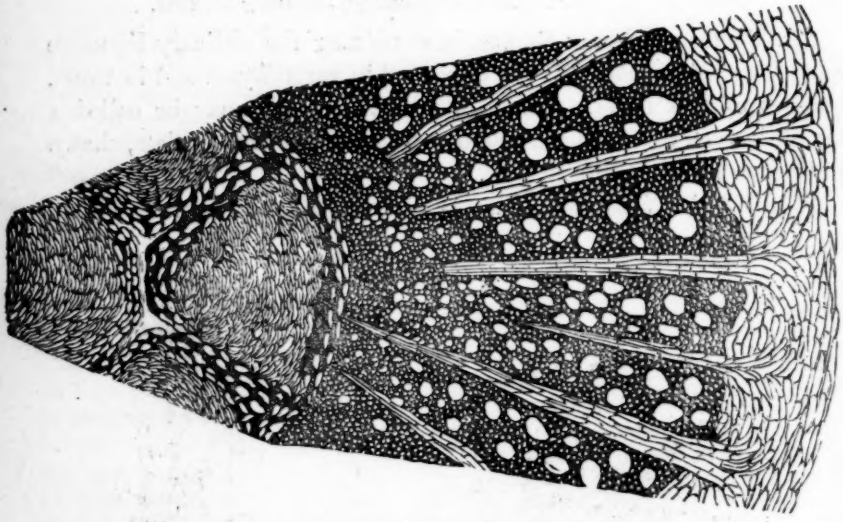
Figure 2 gives a longitudinal view of the same, divested of its surrounding parenchyma. Figures are magnified about 350 diameters.

Such crystals and crystal sheaths are not unique. They are found in the Aspidosperma Quebracho, for which see the essay by Dr. Adolph Hansen, reprinted in the "Therapeutic Gazette," October, 1880, p. 292,

and are also found in the stem of the anomalous Welwitschia mirabilis, for a figure of which see "De Bary Vergleichende Anatomie," p. 140. There is, however, this difference between the liquorice root and the other plants, *i. e.* in the former several fibres are included in a single crystal sheath, while in the quebracho and welwitschia there is but a single fibre.

Mr. Jesse G. Shoemaker contributes two diagnostic characters in the stems and roots (say one-fourth of an inch in diameter) of *Gelsemium sempervirens*, which so far as seen are peculiar in their association,

FIG. 3.

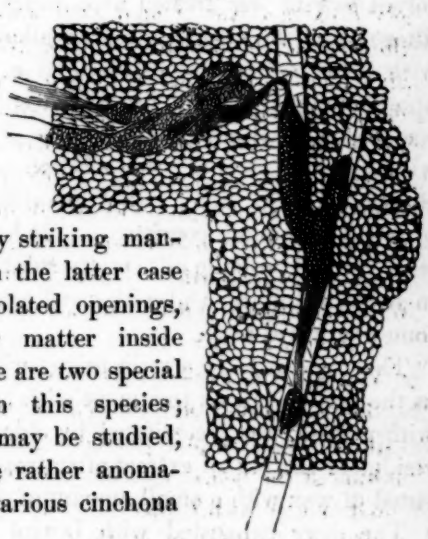


and which hence are of positive value. The first is derived from the medullary rays. These usually widen in a marked manner, going from the centre to the circumference, being *sometimes* much more than twice as broad exteriorly as interiorly. The second character is the tendency of the pith to be penetrated by several plates of large, thin-walled cells, which divide the pith more or less perfectly into four portions. This latter character, though as far as observed it varies considerably in the relations of the large cells and the ordinary pith cells, is always present and plainly enough marked to serve as a means of diagnosis. Tests upon this point have been made on both fresh and dry specimens received at different times from different places. Figure 3 illustrates these peculiarities, magnified about 400 diameters.

Mr. Charles W. Burr has detected starch in the roots of *Coptis trifolia.* In Coptis Teeta, Wallich, found in the Mishmi Mountains, eastward of Assam, and recognized by Flückiger and Hanbury as the officinal coptis, starch is known to be present; though in 1873 Mr. E. B. Gross failed to detect it in our American Coptis trifolia. Mr. Burr has repeatedly verified his observation on authentic specimens.

Mr. Wm. C. McFetridge, working upon the *Apocynum cannabinum,* succeeded in isolating very readily the laticiferous vessels. The illustration shows this quite clearly on longitudinal section. A transverse section shows the same tissue in a very striking manner, with this difference, that in the latter case the vessels are seen as oval, isolated openings, containing bodies of granular matter inside a very delicate cell wall. There are two special points about these vessels in this species; first the ease with which they may be studied, and second, their relation to the rather anomalous laticiferous vessels in the various cinchona barks.

FIG. 4.



ANALYSIS OF THE LEAVES OF CEANOTHUS AMERICANUS, LINNE.

BY J. H. M. CLINCH, PH.G.

From an Inaugural Essay.

Five grams of the air-dry leaves subjected to a heat of 100°C. until they ceased to lose weight, weighed 4·455 grams, showing a loss of ·545 grams = 10·9 per cent. amount of moisture.

Forty grams of the air-dry leaves were incinerated and yielded 1·895 grams of ash = 5·31 per cent., of which 50·526 per cent. was soluble in water, 48·629 per cent. was soluble in hydrochloric acid, ·8 per cent. was soluble in boiling sodic-hydrate. An analysis showed the presence of potassium, calcium, magnesium, aluminium, iron and silica, combined as chlorides and sulphates in the aqueous solution, and as

phosphates, sulphates, and carbonates in the hydrcehloric acid solution (the iron may have been derived from the mill during grinding).

Thirty grams of the powdered air-dry leaves were exhausted with pure benzol and the liquid allowed to evaporate spontaneously, yielding an extract weighing 1·507 grams = 5·64 per cent. This was treated with warm water, allowed to cool, filtered, and the filtrate tested for alkaloids and glucosides with negative results. The undissolved extract was treated with water acidulated with sulphuric acid, filtered, and the filtrate tested for alkaloids; gave a grayish precipitate with potassio-mercuric iodide, and a bright yellow precipitate with phosphomolybdic acid; negative results for glucosides. The residue was washed well with water to free from sulphuric acid, and treated with absolute alcohol; the solution was filtered, treated with animal charcoal, filtered again and evaporated, leaving a pale yellowish mass of a soft and tough consistence. It has an acid reaction, is soluble in ether, benzol, volatile oils, partly soluble in aqueous alkalies, soluble in strong sulphuric acid with a red color, and has a peculiar odor and somewhat acrid taste.

This appears to be a resin mixed with a small quantity of fixed oil, as the portion left on treatment with 80 per cent. alcohol, when boiled with potassa, was precipitated by chloride of sodium as a soap. The residue of the benzol extract after treatment with absolute alcohol consisted of wax with a small amount of coloring matter.

The drug exhausted with benzol was dried and exhausted with stronger alcohol, the extract which weighed 5·801 grams = 21·72 per cent. was treated with absolute alcohol and the soluble portion with distilled water. This solution had an acid reaction, and gave a yellow precipitate with subacetate of lead, which after decomposing with hydrosulphuric acid yielded a filtrate reducing Fehling's solution on heating, and gave a green color with ferric chloride, and a reddish brown color with solution of potassa, showing the presence of an "iron-greening" tannin. A concentrated solution failed to give precipitates with solutions of gelatin and tartrate of antimony and potassium, but gave precipitates with cinchonine and quinine, and reduced nitrate of silver in the specular form when heated. These reactions appear to indicate that it is identical with or closely related to caffetannic acid.

The filtrate from the precipitate by subacetate of lead was freed from lead by H_2S and concentrated. Phosphomolybdic acid and potassio-mercuric iodide failed to produce precipitates, but Fehling's solution

was reduced without heat (glucose). The remaining solution was evaporated to dryness; the residue had very little odor, and at first a sweet taste, passing into that of pop-corn, and was considered to be glucose and extractive matter.

The alcoholic extract insoluble in water gave with dilute sulphuric acid a filtrate in which phosphomolybdic acid and potassio-mercuric iodide gave precipitates the same as in acid solution of benzol extract, and negative results for glucosides.

The alcoholic extract insoluble in dilute sulphuric acid, was entirely soluble in dilute ammonic hydrate and reprecipitated by an acid; it was blackish brown, brittle, opaque, inodorous and tasteless, and in concentrated alcoholic solution had an acid reaction. It was partly soluble in boiling water, not wholly precipitated on cooling, and partly soluble in ether, the solution having a green color; it is an acid resin mixed with coloring matter, and in alcoholic solution gives a precipitate with lead acetate and a green color with ferric salts. That portion of the alcoholic extract which was insoluble in alcohol was found to consist of some coloring and extractive matter.

The leaves previously exhausted with benzol and alcohol, yielded to cold water 12·795 per cent. of extract containing gummy and coloring matter. A decoction of the leaves did not become blue with iodine. 8 pounds of the air-dry leaves distilled with water yielded about 10 grains of a light yellow oil having a strong aromatic odor and a distinct acid reaction.

The precipitates obtained with the benzol and with the alcohol extract by potassio-mercuric iodide were separately treated with stannous chloride and potassa; on exhausting with ether and evaporating, minute apparently crystalline residues were obtained which were not further examined.

Arbutin.—Dr. Mensche (Centralbl. f. Klin. Med.) attributes to arbutin valuable diuretic properties, and states that it may be given in large doses without detriment, and that it is excreted in the urine as hydrokinone; it seems to be specially beneficial in vesical catarrh, and in gonorrhœa may supersede the use of injections.

More than twenty years ago Dr. Carl D. Schroff experimented with arbutin, (Pharmacologie, p. 142), and giving it in doses of 0·1, 0·2 and 0·5 Gm. observed no special action from it; neither the quantity nor the color of the urine was altered, and arbutin could not be detected in the urine.

XANTHIUM STRUMARIUM, LINNE.

BY MATTHEW VENABLE CHEATHAM, PH.G.

Abstract from an Inaugural Essay.

The cocklebur is one of the first plants making its appearance in the spring, and the hogs, which in some of the Southern and Western States are allowed to run at large during the fall and winter to eat the mast, are very fond of the young plant, but almost invariably die after eating them; warm lard and other fatty substances being used as antidotes with only poor success.

The writer extracted the bruised dried fruit, 195·21 grams, with benzin and obtained 29 grams of a yellowish, non-drying fixed oil having the specific gravity ·900 and a peculiar odor somewhat resembling that of freshly extracted flaxseed oil; from the soap prepared with it, oleic acid was obtained, and glycerin was found in the mother liquor of the soap.

With strong alcohol a resinous extract was obtained. The portion soluble in diluted acetic acid gave precipitates with potassio-mercuric iodide, with iodine and with tannin, but not with picric acid; ferric chloride produced a green color, and sugar followed by a drop of sulphuric acid caused a yellowish color slowly changing to carmine and to bright violet red. Ether extracted from the acid solution the principle giving these reactions; but the small quantity subsequently taken up by ether from the same solution rendered alkaline by potassa, did not give these reactions.

Of the resinous substance left after treatment with acidulated water, 4 grams were given to a small dog, producing no visible effects. This substance was freely soluble in ether and alcohol and slightly soluble in potassa and ammonia; ferric chloride added to the alcoholic solution gave a deep green color probably due to a little tannin.

The principle obtained above, though probably not pure, the author thinks may be different from the xanthostrumarin of Zander ("Amer. Jour. Phar.," 1881, p. 271), the latter being precipitated with picric acid and not precipitated with tannin.

Caution about Belladonna Plasters.—Dr. Martin J. Fleming reports a case of well-marked belladonna poisoning, relieved by opium treatment, in the *Medical Record*, January 19, 1884, caused by the application of a plaster to a back that had been somewhat denuded by the use of an irritating liniment.

TANNINS OF OAK-BARK.

By C. Etti.

The tannin of oak-bark exists in two forms, viz., as a tannic acid, which in the free state has a reddish white color, and as an anhydride af that acid, called *phlobaphene*, the color of which is brown-red. The distinction between these two bodies is familiar to tanners, who designate the anhydride simply as "coloring matter," and reject barks containing a large proportion of it, as it imparts too red a color to leather dyed with such barks.

The question as to the existence of a glucocide in oak-bark is now decided in the negative, as tannic acid extracted from the bark by ethyl acetate does not yield any such substance. The reactions which were supposed to indicate the presence of a glucoside were really due to lævulin, which, on treating the bark with dilute sulphuric acid, was converted into lævulose.

The tannic acid obtained by agitating an alcoholic extract of the bark with ethyl acetate may be contaminated with two substances, a brownish green amorphous terpene-resin and phlobaphene. The former may be separated by its ready solubility in ethyl acetate, ethyl oxide, and benzene. The phlobaphene is easily recognized by the brown-red precipitate which it gives with lead acetate.

Quercitannic acid cannot be extracted from the bark in the pure state by ethyl acetate, inasmuch as it decomposes that compound into alcohol and acetic acid almost as easily as sulphuric or hydrochloric acid, and the acetic acid thus set free dehydrates a portion of the tannic acid, producing phlobaphene. Pure quercitannic acid dissolves completely in ethyl acetate, and does not give up any foreign bodies to pure ethyl oxide or to benzene; its solution in very dilute alcohol gives with basic lead acetate a precipitate of pure yellow color.

Phlobaphene is nearly insoluble in water and in ether, but dissolves readily in alcohol of all strengths. As prepared from the bark, it may be contaminated with terpene-resin and pectin-substances. The former of these bodies may be recognized and separated by treatment with ether or benzene, which dissolve it; the pectin-substances by their insolubility in spirit of 90 per cent. The presence of tannic acid in the phlobaphene may be recognized by the fact that the latter, after

being freed from adhering moisture by drying at 110°, gives off a further quantity of water at 130–140°.

Quercitannic acid is represented by the formula $C_{17}H_{16}O_9$. At 130–140°, it gives off water, and is converted into the brown-red anhydride, $C_{34}H_{30}O_{17} = 2C_{17}H_{16}O_9 - H_2O$, identical with the phlobaphene contained in the bark. 1 mol. of this substance boiled with sulphuric or hydrochloric acid gives up 1 mol. water, and is converted into a second anhydride, $C_{34}H_{28}O_{16}$; and by boiling the tannic acid free from anhydrides with either of these anhydrides, a third anhydride, $C_{34}H_{26}O_{15}$, is obtained. These three anhydrides are soluble in alcohol and in caustic alkalis.

Löwe ("Amer. Jour. Phar." 1881 p. 401, 1882 p. 118,) by treating quercitannic acid or phlobaphene with dilute sulphuric acid, or with oxalic acid, has obtained a fourth anhydride, $C_{34}H_{24}O_{14} = 2C_{17}H_{16}O_9 - 4H_2O$, which he designates as *oak-red*. The same name has been applied to the first anhydride by Oser, and to the second by Böttinger.

Another oak-bark examined by the author yielded a tannic acid having the composition $C_{20}H_{20}O_9$, and agreeing with the former in all its properties, excepting in its reaction with ferric chloride, with which it gives a bluish green color, quickly changing to deep green, and on addition of sodium carbonate, first to blue and then to red, whereas the quercitannic acid above described, and all its anhydrides, give with ferric chloride a black-blue precipitate. This tannic acid begins to lose water at 124°, melts at 140°, resolidifies on further loss of water, and is converted into a brown-red substance identical in composition with phlophene.

The tannic acid, $C_{20}H_{20}O_9$, also yields four anhydrides agreeing in character with those obtained from the acid $C_{17}H_{16}O_9$. These anhydrides are represented by the formulæ $C_{40}H_{38}O_{17}$, $C_{40}H_{36}O_{16}$, $C_{40}H_{34}O_{15}$, and $C_{40}H_{32}O_{14}$. The same tannic acid heated in a sealed tube with hydrochloric acid yielded a gas burning with a green flame, but smaller in quantity than that obtained from the acid $C_{17}H_{16}O_9$. Heated in a tube with dilute sulphuric acid, it gave a red liquid and a large quantity of undissolved anhydrides; and on agitating this liquid with ether a small quantity of crystals was obtained consisting of gallic acid.

The phlobaphene submitted to dry distillation, yielded pure catechol, free carbon, and an oil insoluble in potash, smelling like the terpenes and containing 72·46 per cent. C and 7·11 H. This oil, oxidized with

permanganate, yielded an amorphous resin, whence the author concludes that it is derived, not from the tannin, but from the terpenes mixed with the phlobaphene which was submitted to dry distillation.

For the theoretical considerations relating to the constitution of all the bodies above described, the original paper must be consulted.—*Jour. Chem. Soc.*, Nov., 1883; *Monatsh. Chem.*, iv. 512–530.

ON POMEGRANATE BARK.

By William F. Jungkunz, Ph.G.

Abstract from an Inaugural Essay.

The commercial bark on drying in an air-bath, lost 10 per cent. of moisture; 10 troyounces of it exhausted with benzin left a wax-like extract weighing 1 gram; it was free from alkaloid, yielded to alcohol a small quantity of a greenish yellow matter and contained a little fat and wax.

A tincture made from 12 troyounces of the bark with alcohol and concentrating, on standing deposited crystals of mannit. The percolate also contained a little resin, considerable tannin, but no gallic acid, and yielded a small quantity of a light amber colored oily liquid, which was soluble in water, alcohol, chloroform and ether, and gave precipitates with ferrous sulphate, cupric sulphate, plumbic acetate, mercuric chloride and with several group reagents for alkaloids.

For preparing a larger quantity of the alkaloid 60 troyounces of the ground drug were mixed with about an equal weight of milk of lime and percolated with water; the reddish brown liquid was concentrated on a water-bath, exhausted with chloroform and this solvent evaporated; 3·63 grams of impure alkaloid were thus obtained. It was dissolved in alcohol, the solution digested with animal charcoal and the filtrate evaporated; the color was scarcely changed, but considerable of the alkaloid had been lost.

The decoction of the bark contained pectin and mucilaginous compounds, and on incineration the bark yielded 19·61 per cent. of ash, of which 24·36 per cent. was soluble in water, the remainder dissolving in hydrochloric acid leaving a small amount of silica behind. The ash consisted of chlorides, carbonates, phosphates, and sulphates of sodium, potassium, calcium, iron and aluminium. The alkaloid evidently exists in the form of a tannate in the bark.

AQUEOUS MIXTURES CONTAINING POWDERED CHLORATE OF POTASH.

By John Rutherford Hill, Pharmaceutical Chemist.

Read before the North British Branch of the Pharmaceutical Society, Edinburgh, January 16, 1884.

It is a common practice to prescribe gargles, mouth washes and mixtures containing a much larger proportion of chlorate of potash than the aqueous menstruum is capable of dissolving, and the object of the following note is to point out some objections to this practice, and to suggest a more excellent way.

It not unfrequently happens that such gargles, etc., are ordered to be made with boiling water, but no discreet dispenser would be so foolish as to follow the directions of the prescriber in such a case, because, although the whole of the chlorate might thereby be dissolved, it would, of course, be deposited in a crystalline form as the solution cooled.

It sometimes happens, however, that the proportion of chlorate is very near the quantity which the menstruum is understood to be capable of holding in solution at the normal temperature; and in such cases, I believe, many dispensers do not hesitate to facilitate solution by the application of heat. Even in these instances there is always a risk that separation of crystals may ensue, either from an erroneous calculation as to the degree of solubility, or from the normal temperature falling considerably below that at which the solubility estimations were made, and consequently this process is not altogether free from objection.

The least objectionable method is generally understood to be that of reducing the chlorate of potash to very fine powder, using in all cases cold water only and attaching a "shake the bottle" label.

If the chlorate remained in the condition of fine powder this might meet the first difficulty, because, though not in solution, it would be in the next best condition for application to inflamed and ulcerated surfaces. Unfortunately, however, this is not the case, and chlorate of potash gargles, etc., so dispensed soon become unfit for use, owing to the rapidity with which finely powdered chlorate resumes the crystalline condition.

My attention had been frequently directed to this circumstance by

observing that when such gargles, etc., had to be repeated there were very often present, in the bottle which had previously contained them, a few pretty large crystals of chlorate of potash. A short time since the subject was again brought very forcibly under my notice in the following manner.

About twelve months ago I dispensed a gargle containing ʒiv chlorate of potash in eight ounces of water. About one half had been used at the time and the remainder set aside until about two months ago, at which time circumstances arose calling for the use of a similar remedy. The half empty bottle was brought to me to see if the same gargle would be suitable for this case, and I found that the whole of the undissolved chlorate of potash had, in the interval, passed from a condition of fine powder to that of pretty large tabular crystals, and the gargle was therefore in a state quite unfit for use.

It occurred to me that it might be possible to prevent the chlorate resuming the crystalline form, at least for a reasonable length of time, by adding to the gargle some substance likely to interfere with crystallization. To determine this point the following mixtures were prepared:

No. 1. Chlorate of potash ʒj. water to f̄j.
No. 2. Chlorate of potash ʒj. glycerin ʒj. water to f̄j.
No. 3. Chlorate of potash ʒj. simple syrup ʒij. water to f̄j.
No. 4. Chlorate of potash ʒj. gum arabic gr. x. water to f̄j.
No. 5. Chlorate of potash ʒj. gum tragacanth gr. iij. water to f̄j.
No. 6. Chlorate of potash ʒj. honey ʒj. water to f̄j.
No. 7. Chlorate of potash ʒj. treacle ʒj. water to f̄j.

The chlorate of potash was in each case reduced to very fine powder, and the mixtures were all equally exposed to the variable temperature of an ordinary sitting-room.

On examining the specimens about twenty-four hours after they had been so exposed I found that in every one of them a portion of the chlorate had passed into the condition of very thin, sharp-edged tabular crystals, exhibiting in many cases iridescent properties of thin transparent plates. The time of examination was on the morning of the second day when the temperature of the room was several degrees less than it had been in the course of the previous night; a circumstance which, I believe, has a good deal to do with the rapid change of the chlorate from a state of fine powder to that of sharp crystals.

When the temperature of the room rises a quantity of the chlorate

passes into solution and is deposited in the crystalline condition as soon as the temperature falls. This accounts for the change so far as a portion of the chlorate is concerned, but does not explain how the whole becomes ultimately so altered. This, I think, is brought about in the following manner. When the temperature rises a portion of the chlorate dissolves and when the temperature falls it is deposited as crystals. On the temperature again rising a fresh portion of the powdered chlorate is dissolved, because the powder dissolves more readily than the crystals, and this second portion is in turn deposited, either as a fresh crop of crystals, or, more probably, as an addition to those already formed. In this way, with each day's variations in temperature, the process goes on until, as already stated, the whole of the chlorate takes the form of pretty large tabular crystals.

The theory that this change is at least very much accelerated by the variable temperature of an ordinary bedroom or sitting-room was confirmed in the following manner. A mixture containing one drachm of finely powdered chlorate in one ounce of water was kept for a month in a place where the temperature did not vary more than two or three degrees. At the end of that time it was found that the chlorate had passed into a state of small, somewhat granular crystals, showing only a slight tendency to form crystalline plates. In this condition, I believe, it would be less objectionable for use as a gargle than in the other case where a number of sharp-edged plates were formed; but, nevertheless, it appears that, even under the most favorable conditions, it is impossible to retain chlorate of potash in a state of fine powder in presence of water.

From what has been stated it will be apparent that none of the substances employed had the effect of preventing crystallization, and that a single day's exposure to the variable temperature of a sitting-room was sufficient to produce such an alteration of the chlorate as to render the gargle, etc., unfit for use. Treacle, tragacanth and honey seemed to have a slight influence in retarding the process of crystallization; the crystals formed in these mixtures being of somewhat smaller size. They failed, however, to accomplish the object in view, which was not simply retardation but prevention. Thus, then, we have shown that the practice of prescribing such mixtures is open to a serious objection; but there is still another clause to the indictment.

Such gargles or mixtures are frequently directed to be taken in regular specified quantities; the intention being that each quantity

should contain a definite dose of chlorate. In the case of a heavy salt like chlorate of potash, however, subsidence takes place so rapidly that, even though the bottle be vigorously shaken immediately before measuring out a dose, it is practically impossible to obtain a reasonable approach to uniformity, and, therefore, the intention of the prescriber cannot be attained.

The practice to which this note is meant to call attention is then, to say the least of it, shown to be undesirable; I believe it to be also unnecessary.

It is the province of the pharmacist to carry out, with strict fidelity, the directions of the physician, and he may not presume to dictate. While this is so, however, we believe that it is not only his province but his duty to draw attention to defects in prevailing methods and to devise improvements.

Believing this to be so, I venture to suggest that the practice referred to might be advantageously departed from, and that chlorate of potash for such purposes should always be prescribed in the form of powders. The patient could be directed to add the requisite quantity of water at the time of using; there would be no risk from crystallization, and the dose would be uniform. By this means both difficulties would be completely disposed of, and it would be, in every respect, a more excellent way.—*Phar. Jour. and Trans.*, Jan. 26, p. 594.

SOAP MANUFACTURE AND THE SOAP OF COMMERCE.

By Alfred Smetham, F.C.S.

In a paper read before the Liverpool Chemists' Association, Nov. 8th, 1883, the author first briefly described the raw materials employed by the soap maker, and then proceeded to the processes adopted for their conversion into soap. The boiler first supplies himself with a weak solution of caustic and then melts in a pan a quantity of the fat to be operated upon. The specific gravity of the lye—as the solution of alkali is called—should not in the first instance exceed 1·050–1·060. The heat is maintained by means of steam, the direct use of a fire being now practically obsolete. The first action of the caustic is to produce an emulsion, and when this is properly formed more alkali is added, the strength of the lye being gradually increased. The reason why a weak lye must be used in the first instance is that soap is insol-

uble in a strong solution of caustic, and the particles of fat would, by the use of a strong lye, become encased in an insoluble layer of soap, which would prevent further action from taking place. The lye is added in until an excess of caustic is found in the pan. More oil or fat, or, where required, rosin is then added, and the fat or rosin saturated by subsequent additions of lye. When the operator, by examining the texture of the soap, considers the reaction complete, the watery solution of soap and glycerin is decomposed by the addition of salt, in a solution of which soap is insoluble. The soap then rises to the surface in a finely divided state, and after complete separation the spent lye is removed. After the removal of the lye the soap is again heated, and, if necessary, some weak lye added, so that the soap may assume a "close" texture, as it is called. When this is complete the soap is removed, usually by pumping, to another vessel, where it is "crutched." This consists essentially in stirring the mass by rotating arms moved by machinery, by which means the soap is brought into condition, and if of too great consistency more water is added. It is now ready for the frames, composed of slabs of wood or iron placed together in a rectangular form, and made in such a manner that when the soap has solidified the sides may be removed. The soap is left in the frames until it is completely set. When this has occurred, the block is taken out and cut into slabs by means of a wire pulled through it in a horizontal direction. The slabs thus formed are placed upon a table with a movable arm, across which wires are stretched, and the slabs are by this means again divided into bars. It is then, if it be a pure soap, ready for packing. Sometimes, however, it is desired to make up the soap in tablets of given weight. It is then cut up into pieces of the requisite weight and stamped in a press with dyes, the presses usually being worked by hand.

This, then, is a brief outline of the manufacture of a genuine soap; but the exigencies of the case render it necessary to produce a variety of soaps, at cheap prices. This has been brought about by competition and the inability of the public to discriminate between a well-made and a common soap, and consequently it is impossible for any firm manufacturing only pure soaps of high quality to hold its place in the struggle for existence. The cheaper soaps, being more readily soluble in water, produce a lather more quickly than a pure soap, and as the public does not as a rule make comparative trials as to the lasting powers, and is almost invariably led away by a cheap article, the sale

of the best soaps has of late fallen off considerably, and the cheaper kinds have taken their place.

Although I have used the term pure soap to represent a soap manufactured from fat and alkali alone, it would be unfair to designate the common soaps adulterated, as we shall see on considering their nature.

A pure tallow soap will only take a certain proportion of water, and it becomes necessary to mix other substances with it if the percentage of water is increased. A substance which is useful in this respect, and which at the same time has detergent properties, is silicate of soda. This is the substance known as soluble glass, but it is usually sold to the soap boiler in solution. It is composed of silicic acid and soda, in various proportions, and is formed of two kinds, the neutral and the caustic. The neutral has a specific gravity of about 1·370, and contains about 65 per cent. of water. The proportion of silicic acid is about 26 per cent., and the remainder is soda and impurities. The caustic silicate is a much heavier solution, and has a specific gravity of of about 1·700. It contains about 43 per cent. of water, 33 per cent. of silicic acid and the remainder alkali and impurities.

These solutions are either used alone, or in combination, and are added to the soap before finishing. It is necessary to "crutch" well to insure the complete mixing, and the crutching should be continued until the soap is about to set. The silicated soaps generally contain a larger proportion of water than pure soaps, besides the actual weight of silicate, and they can, therefore, be produced at lower prices. The detergent power of these soaps is greater than would be indicated by the pure soap contained in them, and in many districts this variety finds a market more readily than the better qualities. I should here point out that the value of a soap is not altogether determined by the composition. A pure soap may be produced from a discolored tallow or oil, which as a rule injures the appearance and causes it to command a less value in the market.

A form of silicated soap which obtains a large sale is the mottled. This differs essentially from the mottled soap manufactured a few years back, which was pure and necessarily of a high standard. It is usually manufactured from bleached palm oil, or from palm nut oil or cocoa nut oil as the chief ingredient. It is usually run with silicate to a considerable extent and contains a variable amount of fatty acids—the quantity depending on the quality it is desired to make. The mottling

is produced generally by the addition of ultramarine, which gives to the soap a bright appearance.

Some samples, sold at low prices, have come under my notice which have not only been run with silicate but contain from 6 to 8 per cent. of common salt and not more than one quarter of their weight of fatty acids. The salt is of no value as a detergent agent, and must be looked upon simply as a "make weight." It is only with soaps made from palm nut and cocoa nut oil that the salt will combine properly. The peculiar behavior of these two soaps in salt water renders them valuable for marine purposes. Very considerable experience is required in making a soap of low quality which shall be firm to the touch and present the appearances of a good soap, and the difficulty is increased in the case of common mottled soap, where it is necessary to have the mottling equally distributed throughout the mass. The methods by by which this is attained are kept, as a rule, as trade secrets, but no great difficulty is experienced when the matter is approached on scientific principles.

In the common soaps which are usually used for scouring, etc., the proportion of soda in excess of the fatty acids may be greater than in those used for finer purposes or for toilet use. The choice of the fat must also be regulated by the purposes to which the soap is intended to be put.

The details of the manufacture require careful attention, and can only be mastered after long experience, but it is necessary that all the processes should be carried on in the lines I have indicated. The peculiar behavior of each kind of soap would occupy more time than is at my disposal, nor would it serve to elucidate the processes; but it is important that the manufacturer should be conversant with their properties. As a rule, the larger the amount of stearin or palmitin there is in the fat operated upon the harder will be the soap.

Before closing the remarks upon the manufacture I may just refer to two methods which are occasionally resorted to, to improve the appearance of common soaps. The first of these consists in placing the soap in an oven or stove, so that it may become surface died and present a hard "skin." The second of these consists in dipping the soap in a strong solution of brine or other liquid. The salt has a great affinity for water and removes it from the surface of the soap, but the soap itself is quite insoluble. This process improves the

the appearance considerably, and prevents the soap having a sticky consistency on the exterior of the bar.

In treating of the second part of my subject, it may be well to preface my remarks with a brief account of the methods by which I have arrived at the results which I propose to state, as showing the quality of the soaps found in the market. I have now in my possession upwards of three hundred analyses of soap from different sources, which have been submitted to me at various times. In analyzing these I have found the following processes the most convenient and accurate.

The water is determined by drying in an air-bath a weighed portion of the soap at a temperature of 120°C. At this temperature the soap swells up and the water is soon expelled without any loss of the fatty matters or danger of losing the substance. The weight is taken after about three hours, and subsequent weights are made at intervals of about an hour until the weight is constant.

To obtain the percentage of fatty acids I find it best to weigh out about 3 grams of the soap in a porcelain or platinum basin, including in the weight of the basin a small stirring rod about 3 inches long. The soap is then dissolved in a small quantity of water in the basin, and when *completely* dissolved, about 5 cc. of dilute sulphuric acid are added. This decomposes the soap, setting free the fatty acids and forming sulphate of soda. The solution is then gently warmed—preferably on a water-bath—until the whole of the fatty acids have risen. It is then allowed to cool, and the fatty matter will usually form a solid cake. If this does not occur a weighed quantity of purified wax must be added and the whole re-melted. When the cake is formed it is simply moved a little from the side, and the liquid from below, which should contain no fat, is poured off. The cake is re-melted with distilled water and allowed to settle as before. This is continued until the washings are free from acid. The cake is then melted in a water oven and again allowed to cool, and the water which still adheres is removed by gently touching with filter paper, and the basin is again placed in the water oven and weighed until the weight is constant. From the figures obtained the percentage of fatty and resinous acids is calculated.

The soda is determined by adding to the filtered solution from a given weight of soap an excess of standard acid and titrating back the excess of acid by means of standard alkali, using cochineal as indicator.

The percentage of silicate is obtained from the silicic acid found. To obtain this I prefer to ignite about 2 grams of the soap in a platinum dish until the volatile matters are dispersed. After cooling, the ash is covered with a glass and treated with an excess of hydrochloric acid. It is then evaporated to dryness, taken up with dilute acid, well washed and then ignited and weighed.

These are the constituents which it is usually necessary to determine, but it is sometimes required to make a more complete analysis. When this is desired it is a good plan to dissolve the soap in alcohol and filter. By this means most of the adulterating materials are separated. The chlorine is best estimated after decomposing the soap with nitric acid and allowing the fat to solidify, as in the estimation of fatty acids, by precipitating with nitrate of silver and weighing the resulting chloride.

The percentage of free alkali is important. It can be obtained by precipitating the clear alcoholic solution with carbonic acid, but I prefer to titrate the solution with standard acid, using phenolphthalein as indicator. The results are good.

In making out the analysis of a soap it must be remembered that the fatty constituents actually exist as fatty anhydrides and not as fatty acids, and if, therefore, we determine the whole of the constituents of a soap and include the fatty matters as the estimated acids we shall find that the figures will add up to about 103 per cent. This is due to the absorption of water by the fatty anhydrides in decomposition. The actual percentage of fatty acids should always be placed as a foot note.

In making a choice of the soaps usually found in the market is is difficult to know which to take as representative, but it will, perhaps, be sufficient to divide them into two classes, the pure and the silicated. The analyses given of the average qualities of these soaps show the the following:

Soaps.	Fatty Acids.		Soda.		Hydrated Silicate of Soda.		Water.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
Pure.....	63·18	53·74	8·31	6·38	.....	.....	28·13	36·89
Silicated.....	56·91	26·26	7·45	5·30	8·58	1·04	31·41	58·97

—*Phar. Jour. and Trans.*, Jan. 5, 1884, pp. 534–537.

THE OCCURRENCE OF SUGAR IN TOBACCO.

By Professor Attfield, F.R.S.

About a year ago the following questions were put to me, "Does tobacco contain sugar or any similar saccharoid matter? if so, how much?" The subject not previously having come before me I could not definitely reply. Indeed, a search through the literature of tobacco showed that the questions could not satisfactorily be answered at all in the existing state of our knowledge. I therefore proceeded to obtain evidence on the matter by direct chemical investigation. Samples of cut and uncut tobacco were obtained and tested for sugar by the copper test, the fermentation method, and the polariscope. The copper test not yielding concordant results was discarded: it is a good test under most circumstances, but for the quantitative estimation of sugar in tobacco infusions, or probably in similar vegetable infusions and decoctions, it appears to be untrustworthy. The examination of tobacco infusion by the polariscope will be referred to subsequently.

All the samples readily yielded alcohol when properly fermented with yeast; hence all, presumably, contained sugar, the amount varying from 4 to 9 per cent. But as they were obtained from ordinary trade sources, and as tobacco has been known to have molasses, honey, and other varieties of sugar mixed with it, the samples obviously might contain sugar, and yet sugar not be a natural constituent of tobacco.

I therefore proceeded to examine specimens obtained from museums and one which had been raised in my own garden during the previous summer. The latter contained only traces of sugar; but it had been grown in the open, at anything but a tropical temperature, and was not, I think, ordinary Virginian tobacco, but rather the Maryland variety. I may even state, here, that a sample grown in my garden last summer, under better conditions of sunlight, with more care, and from which the flowering tops were frequently nipped off to promote development in the leaves, furnished less than two per cent. of saccharoid matter. Of the other samples some did and some did not afford evidence of the presence of sugar. A specimen of old dark colored Indian leaf gave no sugar, a light colored Indian leaf yielded 1·54 per cent., calculated as cane sugar. A bundle of leaves marked "Original sample as drawn from dock at Liverpool," furnished 10·84 per cent. These results being unsatisfactory, for my purpose, I at

once asked six or eight of my chemical and pharmaceutical friends, residing in different parts of the great tobacco-producing States of America, namely, Virginia, Kentucky, and North Carolina, to obtain for me authentic samples of genuine tobacco. Each correspondent, kindly, at once, acceded to my request. Neither was in any way connected with the tobacco interest, each resided many miles from the rest, and neither of my friends knew that others were simultaneously collecting samples for me.

While waiting for these authentic samples of American tobacco leaves I ascertained that such precipitants as basic acetate of lead and lime water would remove, from tobacco infusions, alcohol-yielding material, equivalent, on the average, to about 3 per cent. of the tobacco. The saccharoid matter not thus separated may be termed *tobacco sugar;* while this, together with the fermentible matter precipitated by the reagents named, may be termed *total saccharoid matter.*

The samples from the United States duly reached me. They yielded the following results:

	IN 100 PARTS OF TOBACCO LEAF.	
	Tobacco Sugar.	Total Saccharoid Matter.
A	7·00	9·87
B	5·57	8·61
C	7·76	10·94
D	9·60	12·80
E	7·43	10·20
F	9·29	12·40
G	5·57	8·23
H	6·81	10·10
Average	7·38	10·39

The inference is obvious, namely, that tobacco does contain sugar, the amount varying from mere traces, in tobacco grown under conditions not favorable for the production of sugar within the plant, up to nearly 10 per cent., or possibly more, in the light colored or bright Virginian leaf. I say that, bearing in mind the origin and the results of the analyses of these specimens, their sugar, or fermentible saccharoid matter, is natural; unless we make the absurd assumption that amongst tobacco growers there exists a secret yet apparently universally enforced

conviction for saturating tobacco plants with a solution of a special and elsewhere unknown variety of sugar.

In cases of suspected sophistication the fermentation method of analysis would probably be adopted, and then as much as 13 per cent. of natural saccharoid matter, or possibly more, might be obtained from tobacco. I myself have examined a large number of commerical samples of tobacco, both uncut leaf and cut, in the form especially of cigarettes, and I have obtained by this method percentages of saccharoid matter varying from 4 to 12½. Even a specimen of a popular dark colored tobacco, specially fermented to develop highly prized odors and flavors, but which, as chemists would expect, had probably lost much of its sugar during the process, yielded 3 per cent. of tobacco sugar and 5¼ per cent. of total saccharoid matter. It will be seen that the greatest yield of sugar from the trade samples is less than the maximum from my standard samples of genuine tobacco. The average yields of the two sets were very close, both being very near to 10½ per cent. The results indicated, therefore, that the trade samples did not contain added sugar.

If a sample of tobacco contained added sugar its percentage of matter soluble in water would also be raised, and the proportion of matter insoluble in water *pro tanto* be reduced. My authentic samples yielded from 32 to 37½ per cent. of insoluble matter, the average being 35·7 One set of commercial samples yielded an average of 35·9 per cent. of insoluble matter; the assumption of any systematic sophistication of these by sugar was, therefore, again negatived.

The sugar in tobacco appears to possess little, if any, action on polarized light. Such a fact would be of considerable importance in any examination of tobacco infusion for added sugar,—sucrose, glucose, lactose, etc.,—which all exert well-marked dextro-rotatory or lævo-rotatory power on polarized light. The commercial samples of tobacco I have myself recently examined, with scarcely an exception, yielded infusions which, even when colorless, did not preceptibly affect a polarized ray; therefore, with a bare exception they were unadulterated by sugar. Certainly samples forwarded to me by officials of the Customs in London, at the request of owners, did not contain added sugar. But the fact has, also, theoretical importance, for the existence of a *tabacose*, as we may term it, if it is a true sugar, having such properties, would point to the existence of a sub-class of fermentible

but non-rotatory sugars. Possibly, however, the action of this fermentible substance on a polarized ray is only masked.

The isolation and complete chemical and physical investigation of the saccharoid principle or principles in tobacco remain to be accomplished. I should myself proceed with this work, but am assured by a friend that he has already commenced and intends to complete and to publish the results of such a research.—*Pharm. Jour. Trans.*, Jau. 12.

TESTS FOR VEGETABLE ALKALOIDS.

By R. Palm.

The author has shown previously that the alkaloids are precipitated by solutions of alkaline sulphides or persulphides, and moreover that in contact with a solution of sodium thioantimonate, solutions of the alkaloid salts form characteristically colored precipitates consisting of the alkaloid hydrosulphides mixed with antimony sulphide. When the solutions of the alkaloid and reagent are dilute, these precipitates appear as colorless turbidities, which become yellow on exposure to the air; whilst with concentrated solutions they are yellow to reddish brown, and in saturated solutions they form resinous masses. The precipitation is more complete in dilute solutions, and is accelerated by gently heating, or by the addition of strong alcohol. In most cases the yellow precipitates are dissolved by excess of the thioantimonate; they are, with few exceptions, amorphous, and dilute acids only partially separate the alkaloid from them. The chemical composition of the precipitates has not been determined. Sodium thioantimonate produces the following changes with the alkaloids referred to. With quinine sulphate in dilute neutral solutions, a white turbidity; in stronger solutions, yellow flocks, which on shaking form resinous lumps and become darker. When hot solutions of the quinine salt and reagent are mixed, resinous masses form at once, which when dry fall to a fine yellow powder like lead iodide. With cinchonine sulphate, in dilute solutions, dark yellow (leather color) flocks form at once; they do not coagulate either on standing or heating. With quinidine sulphate, the effect is almost exactly the same as with the quinine salt, with the exception that the whole of the precipitate does not become resinous, and when dry is of a darker yellow color (an intense dark chrome-yellow): the precipitation is also more complete. With morphine hydrochloride in dilute solutions, yellow flocks are at

once deposited, which are darker in strong solutions, and when dry resemble powdered gamboge in color. With codeine hydrochloride, a flocculent precipitate is produced, which when dry resembles the quinidine precipitate in tone, being a paler yellow than the morphine precipitate. With narcotine, in concentrated hot solutions, the precipitate coagulates in resinous masses, which when dry have the color of dry precipitated ferric hydroxide. With strychnine nitrate, the reaction is more sensitive than with all the other vegetable alkaloids, the strychnine being entirely precipitated, and moreover the precipitate is not soluble in excess of the reagent. In dilute solutions of strychnine nitrate, colorless flocks separate which become yellowish in air; in concentrated solutions, yellow flocks form which do not coagulate on standing, and when dry are of a fine intense deep golden yellow color. With brucine nitrate, when the reagent is added in successive portions to a moderately concentrated solution of this alkaloid salt, three distinct precipitates are obtained: 1. Reddish yellow, which collects in resinous masses. 2. Light golden yellow flocks. 3. Colorless flocks, which form a crust on the surface of the liquid. When the mixed precipitates are boiled with water, the greater part dissolves, leaving an amorphous deep orange residue. The solution deposits yellow crystals of the double sulphide.

With atropine sulphate in strong solutions, a yellow deposit is formed, which coagulates on shaking or heating, but when dry is not so dark as the dry morphine precipitate.

With bebeerine hydrochloride, a dark colored precipitate is formed which coagulates in strong, and especially in hot, solutions, and when dry is greyish brown. The alkaloids also form double sulphides with other metallic sulphides.

Lead chloride can be used as a reagent for vegetable alkaloids; it should be dissolved in a solution of sodium chloride, which dissolves more of the lead salt than cold water does. The precipitates are generally crystalline, and consist of a mixture of lead chloride and an alkaloid salt. Quinine and brucine form crystalline powders; cinchonine, morphine, and codeine small fine needles; the strychnine precipitate when dry forms a crystalline asbestos-like felted mass. The lead chloride is not so delicate a test as the thioantimonate. A strong solution of sodium chloride completely precipitates bebeerine from its solutions.—*Jour. Chem. Soc.*, 1884, p. 120; *Chem. News.*, vol. 48, p. 65.

THE SALTS OF NARCOTINE.[1]

By David Brown Dott, F.R.S.E., Pharmaceutical Chemist.

The subject I have chosen for discussion in this short paper has not, at first sight, a very obvious interest for pharmacists, but, I think further consideration will show that it has a bearing on pharmacy in two ways. These are, firstly, the importance of narcotine on account of its presence in nearly all the Pharmacopœia preparations of opium; and, secondly, the possibility of its salts passing into therapeutical use.

No one can have studied, ever so slightly, the literature of opium and its assay, and have failed to observe how frequently narcotine has been to the chemist a stumbling-block and source of trouble. We need not now discuss in what various ways this has arisen. Although it is now many years since Regnault and Robiquet prepared and analyzed the muriate of narcotine, there is still a prevalent idea that narcotine is not an alkaloid at all, or, at any rate, that it does not form well defined salts. In support of this statement it would be easy to select suitable quotations from several writers, but I shall take as my text the following from Professor Flückiger:[2] "The narcotine is present chiefly in the free state, as it is not really an alkaloid; it is, therefore, not, or not entirely, removed by water. With acetic acid, as well as with other acids, narcotine forms not well-defined salts; the acids are simply solvents from which it again separates as soon as the acid is neutralized." This is for the most part erroneous, as we shall very soon see. Let us first consider the various salts and their properties, so far as our knowledge goes.

Meconate.—This salt first engages our attention, as it is almost certainly the form in which narcotine exists naturally in opium. When narcotine and meconic acid are dissolved together in water, in molecular proportions, *i. e.*, two molecules of the base to one of the acid (which is di-basic), a syrupy solution is obtained which refuses to yield crystals. If evaporated, the salt dries as a varnish. Unlike most amorphous salts this is not readily taken up by water. When the proportions for the acid meconate are used, a clear viscous solution is obtained. This ultimately becomes filled with crystals, but I have not yet ascertained

[1] Read at an Evening Meeting of the North British Branch of the Pharmaceutical Society, January 16, 1884.

[2] "Year Book of Pharmacy," 1879, p. 543.

whether they are really a crystalline acid salt, or only the neutral salt with separated acid. "The books" give no information about these meconates.

Acetate.—This is one of the only two crystalline salts mentioned by the older authorities. According to Berzelius, it is prepared by "dissolving narcotine in concentrated acetic acid, and evaporating *in vacuo* in presence of lime." We prepared a quantity of acetate according to these directions (leaving out the lime). Narcotine will not dissolve in an equivalent of glacial acid; indeed, a clear solution was only obtained by warming with several times that amount. On cooling, the solution before long became filled with crystals, which were strongly pressed, first in calico and then between blotting paper. The crystals were immediately bottled, and two portions weighed off as quickly as possible. One of these was mixed with ten times its weight of calcic hydroxide, and exposed in the water-bath, while in the other the narcotine was determined by precipitation with ammonia.

23·04 grs. lost in w.-b. 0·36 gr. = 1·56 per cent.

26·45 grs. treated with cold water left undissolved 24·28 grs. By NH_3 0·66 gr. was obtained in addition, making the total narcotine = 94·29 per cent.

	Calculated.	Found.
$(C_{22}H_{23}NO_7)_3 . C_2H_4O_3 . H_2O$	+ N 94·07	94·29
	H_2O 1·36	1·56

Whence it is probable that the salt obtained as just described has the above composition. In any case, it is of no value on account of its insolubility in water, or (what amounts practically to the same thing) its immediate decomposition by water.

Hydrochloride.—The dry salt was correctly described by Regnault and by Robiquet, but they make no mention of water of crystallization. Dr. Wright was the first who fully investigated this salt, and our analysis leads to the same conclusion, that the normal hydrochloride has the composition $C_{22}H_{23}NO_7 . HCl . H_2O$. Strong solutions of this salt show a curious tendency to gelatinize, like the salts of cryptopia. The muriate of narcotine may be regarded as its most important salt, being easily prepared and fully soluble.

Sulphate.—I have not been able to find any published reference to this salt, which is readily obtained by dissolving narcotine with the theoretical proportion of sulphuric acid and allowing to crystallize.

Some of these crystals were dried by exposure to the air, and a weighed quantity of the air-dry salt placed in the water-bath.

14·55 grs. lost 0·10 gr. = 0·68 per cent.

Two portions of same salt dissolved in water, excess of ammonia added, and the precipitates collected and weighed.

17·200 grs. gave 14·30 grs. = 83·13 per cent.

6·555 grs. gave 5·45 grs. = 83·14 per cent.

14·55 grs. dried at 130° C. gave only 78·35 per cent., indicating decomposition at that temperature.

The salt dried in water-bath lost weight further in the air-bath at 120°. 9·74 grs. lost 0·675 gr. = a loss in weight of 6·93 per cent. on the air-dry salt.

From the results obtained it was suspected that the sulphate used in these experiments had been over dried by too long exposure to the air. A quantity of it was therefore moistened with water, and when apparently just dry was transferred to the water-bath.

9·740 grs. lost 1·48 grs. = 1·48 per cent.

It would therefore appear that narcotine sulphate has the composition $(C_{22}H_{23}NO_7)_2 . H_2SO_4 . 4H_2O$, and that it loses one molecule of its water below 100° C., the remainder at a higher temperature.

		Calculated.	Found.
$\overset{+}{N}_2H_2SO_4 . 4H_2O$	H_2O	7·22	6·93
$\overset{+}{N}_2H_2SO_4 3H_2O . H_2O$	H_2O	1·71	1·48
$N_2H_2SO_4 3H_2O . H_2O$	$\overset{+}{N}$	82·93	83·13

We have not prepared any other salts besides these, and it is indeed unnecessary to do so. The meconate, muriate and sulphate dissolve completely in water, and their solutions remain clear even when largely diluted. Not so the acetate. By adding hot water to a solution of narcotine in dilute acetic acid, the greater part of the alkaloid is precipitated. One thing is noticeable regarding all salts of narcotine, that their solutions are *acid, i. e.*, they behave as if they contained free acid. This I have no doubt they do, in common probably with all acid solutions of salts. When such a solution is shaken up with a solvent capable of dissolving the base, some of the base is taken up; as when a solution of narcotine muriate is agitated with ether. The process may perhaps be expressed in this way: Narcotine, hydrochloric acid, and water have each an affinity or attraction for the others. When narcotine muriate is dissolved in water, the latter attracts the acid so as

to cause a certain amount of decomposition in the salt, the affinity between the base and acid not being strong enough to resist the action of the water. Yet this affinity is sufficient to prevent any great decomposition, such as we have in the case of the acetate, where the addition of water causes an almost complete precipitation of the alkaloid. A kind of equilibrium is established, depending, no doubt, on the relative masses of the different components. When a portion of one of these is removed, as narcotine by benzine, the equilibrium is disturbed and rights itself by a little more decomposition, and so on. But it is not necessary to have the salt in solution in order to remove the base by an appropriate solvent. So weak an alkaloid is narcotine that its salts are decomposed, to some extent, by such compounds as ether and "benzin," so that by simply rubbing up the dry salts with one of these solvents, an amount of the alkaloid is dissolved out. Having regard to all these facts, and to what is known otherwise of narcotine and of opium, we are led to the conclusion that narcotine is undoubtedly an alkaloid, that it readily forms salts, and that it exists in opium as meconate (at least for the most part). It is no uncommon occurrence for alkaloidal salts to crystallize with varying proportions of combined water according to circumstances. I have observed this in the case of narcotine hydrochloride, one sample giving numbers indicating three molecules of water. According to Beckett and Wright, the hydrochloride of narcotine forms a series of basic salts by successive crystallizations from hot water. Their experiments I have not repeated, but the muriate certainly stands one recrystillization without decomposition.

Gmelin[1] states, on the authority of Bouchardat, that the molecular rotatory power ot narcotine is $-130{\cdot}6°$ or $-151{\cdot}4$ for the red ray, but that it is not ascertainable with exactness on account of the slight solubility of the alkaloid in alcohol and ether. "On addition of acids it acquires a rotatory power towards the right, the original rotatory power being brought back by neutralization with ammonia." The rotatory power of acid solutions of narcotine was found by Bouchardat to vary according to the quantity and nature of the acid. More recently Hesse has determined the specific rotatory power of narcotine with the following results:[2]

	Alcohol.	Chloroform and alcohol.	Chloroform.
C =	0·74	2	2 and 5
$[a]_D$ =	−185·0	−191·5	−207·3

[1] "Handbook," xvi, 137.

[2] "Watts' Dict.," viii, 1223.

It may be thought that these numbers do not agree very well, but it is now understood that the "specific rotatory power" may vary according to the nature and proportion of the solvent used; even although that solvent has no action by itself on polarized light. All that we obtain in such cases is an apparent rotatory power which may differ widely from that of the pure substance. It is, therefore, necessary to state the solvent and the percentage of substance dissolved therein, as the angle of rotation does not vary directly as the amount of substance, when the latter is in solution.

Before knowing of Hesse's work on the subject, I determined the specific rotatory power of narcotine dissolved in "benzin," the solution containing 1·59 per cent. My friend Mr. W. Peddie, Assistant to the Professor of Natural Philosophy in the University, kindly made a duplicate determination for me, he using a Dubosc'q's polariscope with compensator, and I using a Jellet. Our results are practically identical and give the value $[\alpha]_D = -229°$. It was, of course, ascertained in the first place that the benzin did not affect appreciably the polarized light. I can confirm Bouchardat's observation that acids change the polarization from left to right, a solution of narcotine in dilute oxalic acid giving $[\alpha]_D = +62$.—*Pharm. Jour.* and *Trans.*, Jan. 26, 1884, p. 582.

CINCHONAMINE.

By Arnaud.

Cinchonamine, $C_{19}H_{24}N_2O$, (See "Am. Jour. Phar.," 1882, p. 76) exists in *Remijia purdiana*, but is not contained in *R. pedunculata*, which contains quinine. To extract cinchonamine, the finely powdered bark is exhausted with very dilute sulphuric acid, the solution filtered, boiled, and precipitated with milk of lime. The precipitate is dried on porous tiles, and digested with boiling ether. The ethereal solution is decanted from undissolved resinous substances, etc., washed with dilute hydrochloric acid, which removes the cinchonamine, and the acid solution of cinchonamine hydrochloride is evaporated to crystallization. The hydrochloride is dissolved in boiling dilute acid, filtered through animal charcoal, and recrystallized. The free base is obtained by adding ammonia to a solution of the hydrochloride, and crystallizing the alkaloïd from boiling ether. An alcoholic solution of the alkaloïd is dextrogyrate, its rotatory power being $[\alpha]_D = +122·2°$. Accord-

ing to Dr. Laborde, cinchonamine is highly poisonous, even in very small doses.

The salts of cinchonamine generally crystallize readily, and are but slightly soluble in water, especially in presence of free acid. They dissolve in hot alcohol, from which they crystallize on cooling. The *hydrochloride* crystallizes from an acid solution in thin, brilliant, anhydrous, prismatic lamellæ, very slightly soluble in acidulated water. From a neutral aqueous solution, the salt crystallizes in opaque flattened prisms containing 1 mol. H_2O. These crystals effloresce, and are much more soluble in water than the anhydrous salt. This property of the hydrochloride to crystallize in an anhydrous condition from acid solutions furnishes a method of separating cinchonamine from all the alkaloids with which it is associated in *R. purdiana*. The *hydrobromide* forms brilliant, slender, anhydrous needles, slightly soluble in cold water, much more soluble in hot water. The *hydriodide* crystallizes in micaceous plates, almost insoluble in cold water. The *nitrate* is only slightly soluble in cold alcohol, but is much more soluble in hot alcohol, from which it crystallizes in hard, thick, short prisms. This salt is slightly soluble in pure water, but is insoluble in acidulated water, and is precipitated on adding nitric acid to even a dilute aqueous solution of any cinchonamine salt. The precipitate is at first flocculent, but, on standing, it rapidly becomes crystalline, the crystals being small prisms, which polarize light. At 15°, 100 parts of alcohol of 94° dissolve 0·825 part of the salt; 100 parts of water at the same temperature dissolve 0·2 part of salt. The *sulphate* can be purified by crystallization from alcohol. A solution of the salt in water containing 1 mol. H_2SO_4 has a rotatory power at 15° $[\alpha]_D = +43{\cdot}5$; at 25° $[\alpha]_D = +42{\cdot}2$. The *formate* crystallizes with difficulty. The *acetate* is very soluble in water, from which it is deposited as a resinous mass on evaporation. By spontaneous evaporation of the aqueous solution the salt is obtained in deliquescent crystalline concretions. The *oxalate* does not crystallize from an aqueous solution, but is deposited in a resinous form. The *tartrate* forms a crystalline powder consisting of small hexagonal prisms which polarize light. 100 parts of water at 15° dissolve 1·150 parts of the salt. The *malate* forms brilliant nacreous plates, very slightly soluble in cold water, but somewhat soluble in boiling water. The crystals retain 1 mol. H_2O at 120°, but melt and become anhydrous at 160°. 100 parts of water at 15° dissolve 1 part of malate. The *citrate* is deposited from a boiling solution on cooling

as a resinous mass, which gradually becomes crystalline, forming concretions composed of brilliant prisms which polarize light. 100 parts of water at 16° dissolve 1·950 parts of the citrate.—*Jour. Chem. Soc.* 1884, p. 87; *Comp. Rend.* vol. 97, p. 174.

PUTREFACTION ALKALOIDS.

By A. Poehl.

Epidemics caused by unsound bread have long been recognized, and it has been observed that they are preceded by long-continued rains and floods, which cause an abundance of ergot (*Claviceps purpurea*) in the following harvests. These epidemics take two forms, viz., *Ergotismus convulsivus* more common in France, Switzerland, and this country, and *Ergotismus gangrænosus*, which prevails in Russia, Germany, and Sweden. In Russia there were two remarkable outbreaks of the latter in the years 1832 and 1837, which caused a mortality among children attacked of 1 : 1·75 to 1 : 4, and of the former in 1824. In the course of the rainy summer of 1881 Russia was threatened with another outbreak of ergotismus; accordingly the Minister of the Interior instituted a Commission, of which the author was a member, to investigate this phenomenon of ergot.

Eichwald in his history of ergotismus epidemics, has shown (1) that the appearance of the epidemic stands in no direct relation to the proportion of blight in the grain; (2) that animals cannot be so inoculated as to produce in them similar symptoms; (3) that the putrefaction of the corn is a necessary condition of the ergotismus; (4) that the poisonous results are produced only in certain stages of the decomposition; (5) that the various forms of ergotismus cannot be explained by the quantity of ergot introduced within the system or its time of action.

In the present paper, the author elucidates the following conditions of the putrefaction alkaloids in blighted rye meal: (1) the conversion of the starch into glucose; (2) fermentation of the glucose with formation of lactic acid, (3) peptonizatiom of the albumins by the peptic action of the mycelium of *Claviceps purpurea;* (4) conversion of the peptone into ptomopeptone, and its decomposition with formation of putrefaction alkaloids.

Firstly. In the year 1873, the author recognized that damp caused in the meal a large proportion of glucose, by the action of a ferment

contained in the endocarp and perisperm of the grain. The experiments of Hammersten have also proved that the starches of maize, rye, and oats are more easily converted into glucose by diastatic action than the starches of potatoes, peas, and wheat (comp. Bell's recent researches, *Jour. Chem. Soc.*, 1883, p. 1160). In this connection it may be mentioned that the inhabitants of Lombardy suffer from an epidemic caused by maize. A form of mildew has been observed on maize, and this has the power of peptonizing albumins, with formation of putrefaction alkaloids.

Secondly. In the presence of a ferment the glucose would further decompose into butyric and lactic acids.

The author further observed that rye grain, even if not attacked by the claviceps, yet when merely exposed to damp, evolved trimethylamine when heated with alkalis, and it is well known that albumins at the moment of putrefaction evolve ammonia or amines under the action of alkalis.

Thirdly. One of the most important phenomena of the change of the albumin of meal is the formation of peptones; it has also been noticed that lactic acid is a better test for peptonization than other acids, as phosphoric, acetic, oxalic, or tartaric. The author has frequently observed the formation of peptone from the albumin of meal, caused by the action of *Penicillium glaucum* and the fungus of *Claviceps purpurea*, the latter of which produces the most marked effects.

Fourthly. The author exposed pure and tainted rye meal to a damp atmosphere, and found that the latter more readily entered into decomposition, with formation of the putrefaction alkaloids or ptomaines. Further large quantities of pure and tainted meal were allowed to rot, and the putrefying mass examined from time to time by Stas-Otto's process. From alkaline and from acid etherial extracts of the mass, substances were obtained of various degrees of consistence and of various odors. These products gave all the general reactions for alkaloids, and differed from one another towards precipitants and color reagents according as they had been obtained at various stages of the decomposition. By shaking the alkali solution with chloroform, benzene, and amyl alcohol, an alkaloid was obtained, which gave precipitates with potassio-mercuric iodide, phosphomolybdic and tungstic acids, potassio-bismuth and cadmium iodides, platinum and gold chlorides, etc. It also gave a beautiful violet coloration with Fröhde's reagent (sulphuric acid and sodium molybdate), resembling that produced by morphine; the absorption-spectra, however. of the two alka-

loids differ most markedly. The author was only able to observe the formation of the above alkaloid during summer time.

Starting from the view that peptones on further putrefaction are converted into ptomopeptones which yield nitrogen when heated with sodium hypobromite, then the quantity of nitrogen so evolved may be taken as a measure of this conversion. Accordingly the author made comparative experiments with samples of damp rye meal and meal mixed with peptic ferment, with 5 per cent. ergot, and with blight. The results are given in the table below.

Time of Action.	Percentage of nitrogen given off from			
	Pure meal.	Meal with blight.	Meal with ergot.	Meal with peptic ferment.
3 days.....	0·1316	0·1671	0·1933	0·3762
4 "	0·1527	0·2592	0·2909	0·3949
8 "	0·1989	0·2842	0·3157	0·4210
13 "	0,2196	0·3415	0·4269	.....
20 "	0·5259	.....	0·5662	.....

From these results it follows: (1) that ergot and mould have a peptonizing action on the albumins and favor their decomposition; (2) the degree of putrefaction of the albumins is directly proportional to their peptonization; (3) in the first stages of putrefaction, the decomposition of the albumins is greater in ergot meal than in mouldy or pure meal, but in the more advanced stages these differences are not so marked. Further researches on the decomposition of albumins by the *Claviceps purpurea*, and the part played by various genera of fungi are promised.—*Jour. Chem. Soc.*, Dec., 1883; *Berichte*, xvi, p. 1975.

The Physiological Action of Coffee.—According to the result of experiments recently made by Messrs. Couty and Guimaraés to ascertain the precise physiological action of coffee, that beverage is not a preventer of tissue-waste. The maintenance of nutrition is, no doubt, improved by its consumption, as Gubler asserted; but simply because it involves an increased assimilation of nitrogenous food through improving the appetite, when not taken in excess, and thereby encouraging its consumer to take nutritious food.—*Louisv. Med. News; Brit. Med. Jour.*

A "RENNET" FERMENT CONTAINED IN THE SEEDS OF WITHANIA COAGULANS.[1]

By Sheridan Lea, M.A., Trinity College, Cambridge.

The Report of the Royal Gardens at Kew for 1881 contains abstracts of correspondence in which it was pointed out that, in order to introduce a cheese-making industry in India, some vegetable substitute must be found for the ordinary animal rennet, since cheese made with the latter is unsaleable among the natives. In response to the above "Surgeon-Major Aitchison brought to the notice of the authorities at Kew that the fruit of *Puneeria*[2] *coagulans*, a shrub common in Afghanistan and Northern India, possesses the properties of coagulating milk;" and experiments showed that an aqueous extract of the seed-capsules of the above plant does somewhat rapidly coagulate milk.

I was recently requested to make some eperiments on the seeds of *Withania* to determine whether they contain a definite ferment with the properties of ordinary rennet, and the applicability of such a ferment to cheese-making purposes.

The material supplied to me consisted of an agglomerated dry mass of seed-capsules and fragments of the stalks of the plant. When crushed in a mortar the whole crumbled down into a coarse powder, in which the seeds were for the most part liberated from the capsules. I picked out the larger pieces of stalk, sifted out the finer particles, chiefly earth and fragments of the capsules, and then by a further sifting I separated the seeds from the other larger particles. The seeds appeared to be each enveloped in a coating of resinous material, presumably the dried juice of the capsules in which they had ripened.

Taking equal weights of the seeds, I extracted them for twenty-four hours with equal volumes of (i) water, (ii) 5 per cent. sodic chloride, (iii) 2 per cent. hydrochloric acid, (iv) 3 per cent. sodic carbonate. Equal volumes of each of the above were added in an acid, alkaline, and neutral condition to equal volumes of milk, and heated in a water-bath at 38°C. The milk was rapidly coagulated by the salt and sodic carbonate extracts, much less rapidly by the other two; of the four, the salt extract was far the most rapid in its action. All subsequent

[1] Communicated by Professor M. Foster, Sec. R.S.—From the "Proceedings of the Royal Society."

[2] The genus *Puneeria* is now reduced by botanists to *Withania*.

experiments have shown that a 5 per cent. solution of sodic chloride is the most efficient in the extraction of the active principle from the seeds.

There is no doubt that the substance which posssesses the coagulating power is a ferment closely resembling animal rennet.

I. A portion of the 5 per cent. sodic chloride extract loses its activity if boiled for a minute or two.

II. The active principle is soluble in glycerin, and can be extracted from the seeds by this means; the extract possesses strong coagulating powers even in small amounts.

III. Alcohol precipitates the ferment body from its solutions; and the precipitate, after washing with alcohol, may be dissolved up again without having lost its coagulating powers.

IV. The active principle of the seeds will cause the coagulation of milk when present in very small quantities, the addition of more of the ferment simply increasing the rapidity of the change.

V. The coagulation is not due to the formation of acid by the ferment. If some of the active extract be made neutral or alkaline and added to neutral milk, a normal clot is formed, and the reaction of the clot remains neutral or faintly alkaline.

VI. The clot formed by the action of the ferment is a true clot, resembling in appearance and properties that formed by animal rennet, and is not a mere precipitate.

Having thus determined the presence of a rennet ferment in the seeds, I endeavored to prepare an active extract, which should be applicable for cheese-making purposes. All the extracts of the seeds are of a deep brown color, and it appeared, therefore, in the first place desirable to obtain less highly colored, if not colorless, solutions, which should still be active. In this I have so far failed. The precipitate caused by alcohol carries down the chief part of the coloring-matter also, so that on being subsequently redissolved the solution is nearly as highly colored as before the precipitation. The color can be removed by using animal charcoal, but the ferment is at the same time destroyed. If all excess of charcoal is avoided and the solution is filtered at once, the filtrate is largely decolorized, but contains only traces of the ferment. Animal rennet is similarly removed by filtration through charcoal. The color can be removed by the addition of very finely-powdered kaolin in a dry state, but, as before, the ferment activity is thereby destroyed. The same holds good of animal rennet. The

coloring-matter is scarcely soluble in either ether or alcohol, so that no advantage is gained by a preliminary treatment with these before extraction with the salt solution. I have also endeavored to get rid of the color by treating the seeds as rapidly as possible with successive quantities of water before making the final extract. By using a centrifugal machine I was able to wash the seeds six or seven times with large volumes of water without their being exposed for any considerable time to the action of the water. Each portion of water was highly colored and the seeds were thus freed from adherent coloring-matter. But, apart from the fact that some, though not much, ferment is thus lost, no special advantage is obtained, since the seeds are themselves colored, and even after prolonged treatment with water the final extract is always of a dark brown color.

In order to obviate the disadvantages of this coloring matter, if disadvantage it is, I have found it best to prepare very concentrated active extracts of the purified seeds, so that it should only be necessary to add a very small quantity of the extract in order to coagulate the milk and obtain a colorless curd. This I have done by grinding the dry seeds very finely in a mill and extracting them for twenty-four hours with such a volume of 5 per cent. sodic chlordide solution that the mass is still fluid after the absorption of water by the fragments of the seeds as they swell up. From this mass the fluid part may be readily separated by using a centrifugal machine (such as is used in sugar refining), and it can then be easily filtered through filter-paper; without the centrifugal machine the separation of the fluid from the residue of the seeds is tedious and imperfect, 40 grams of the seeds treated as above with 150 cubic centims. of 5 per cent. sodic chloride solution gave an extract of which 0·25 cubic centim. clotted 20 cubic centims. of milk in twenty five minutes, and 0·1 cubic centim. clotted a similar portion of milk in one hour. When added in these proportions the curd formed is quite white. The presence of the coloring-matter is however, perhaps on the whole unimportant, since even if a larger quantity of the ferment extract is added in order to obtain a very rapid coagulation the coloring matter is obtained chiefly in the whey, the curd being white.[1]

[1] It is extremely probable that some stage in the growth or ripening of the seeds of *Withania* might be found at which the development of coloring-matter is slight, while at the same time the ferment is present in considerable quantity.

The question of preparing an extract which should be capable of being kept for a considerable time is perhaps of importance. Ordinary commercial rennet usually contains a large amount of sodic chloride and some alcohol. One specimen I analysed contained 19 per cent. of common salt, and 4 per cent. of alcohol. I have, therefore added to the 5 per cent. chloride extract mentioned above, enough salt to raise the percentage of this to 15 per cent., and also alcohol up to 4 per cent. The activity of the extract is not appreciably altered by this, and such a preparation corresponds very closely in activity with a commercial solution of animal rennet with which I compared it. The possibility of making extracts which may be expected to keep is thus indicated, but of course time alone will show whether the activity of the ferment is impaired to any important extent by such keeping.

I may add in conclusion that I have coagulated a considerable volume of milk with an extract such as I have described, and prepared a cheese from the curds. I have also given a portion of the extract to a professional cheese-maker who has used it as a substitute for animal rennet in the preparation of a cheese. The product thus obtained, and the statements of the person who has made the experiment for me, lead me to suppose that extracts of the seeds of *Withania* can be used as an adequate and successful substitute for animal rennet—*Pharm. Jour. Trans.*, Feb. 2, 1884, p. 606.

FERMENTATION OF CELLULOSE.

By H. Tappeiner.

Finely divided cotton-wool or paper is introduced into a flask containing a neutral one per cent. solution of extract of meat. The vessel is heated at 110°, and when cold a small quantity of the contents of the pancreas is added. Fermentation begins in a few days: the gases evolved consist chiefly of marsh-gas and carbonic anhydride. These two gases are in the ratio of 1 to 7·2 at the beginning of the process, but the carbonic acid afterwards diminishes to the ratio of 1 : 3·4.

The actual figures are:

	Commencement.	End.
CO_2 ..... } SH_2 ..... }	85·48	76·98
H	0·03	.....
CH_4	11·86	23·01
N	2·73	.....

Acetic and isobutyric acids are the chief products of the fermenta-

tion, 5·5 grams of cotton-wool yielding 5·8 grams of volatile acids. Acetaldehyde is also formed. Cellulose undergoes similar fermentation in the first stomach of ruminants and in the alimentary canal of herbivora. When the preceding experiments are varied by rendering the meat-extract feebly alkaline, by adding Nägeli's solution (potassium phosphate 0·2 gram, magnesium sulphate 0·04 gram, and calcium chloride 0·02 gram), or a solution containing in addition to the above salts, 0·35 per cent. of ammonium acetate, 0·3 acetamide, or 0·6 asparagin, the following results were obtained:

	0·5 per cent. solution of meat extract,	Asparagin.	Acetamide.
CO_2 ..... SH_2	55·39	86·47	78·14
H.....	42·71	5·73	13·68
N.....	1·90	7·80	8·18

No difference could be detected in the bacteria in the two kinds of fermentation. In addition to aldehyde, isobutyric and acetic acids, a small quantity of ethyl alcohol appears to be formed by the "hydrogen" fermentation of cellulose.

Alcohol, aldehyde and acetic acid are produced during the fermentation of hay. The gases evolved contain CO_2 51·15, H 44·58, CH_4 0·9, N 4·18 per cent.—*Jour. Chem. Soc.*, Dec., 1883; *Berichte*, xvi, 1734–1740.

Chloroform Water.—This application, which is much employed in Paris, is prepared as follows: An excess of chloroform is poured into a bottle three parts filled with distilled water, and, after repeated shaking, the mixture is allowed to stand until the extra chloroform is deposited and the liquid quite clear. The transparent portion is then to be removed by a syphon, forming a saturated solution of ten grams of chloroform per liter. Applied on compresses, either in its pure state, or diluted with a half or its whole weight of water, it is found to relieve superficial pains; but when these are more deeply situated, a very hot linseed meal poultice is first applied, which is afterward replaced by the compress of chloroform-water. Active revulsion is thus produced, which relieves the pain. Associated with a weak solution of opium, it relieves vague dental pain; and with syrup of morphia it is successfully given internally for various forms of *malaise* from indigestion, such as gapings, eructations, sense of weight, etc. It is also useful as a palliative in cancer of the stomach.—*Union Médicale—Louisv. Med. News.*

SOME AFRICAN KOLAS,

IN THEIR BOTANICAL, CHEMICAL AND THERAPEUTICAL ASPECTS.[1]

BY E. HECKEL AND F. SCHLAGDENHAUFFEN.

Among the vegetable products of the African soil, there is perhaps none more interesting and valuable than those which under the various names of "kola," "gourou," "ombéné," "nangoué," and "kokkorokou," are used as articles of consumption throughout tropical and equatorial Africa, as equivalent to tea, coffee, maté and cacao. Used under the form of seeds, probably from time immemorial, by the native tribes, these products are of varying botanic origin, and their history has been up to the present time imperfectly known; but the authors have been able to avail themselves of the observations of some recent travelers to clear up some obscure points.

The products which are included by the authors under the name "kola" (the various synonyms quoted being special to particular countries) consist of seeds, yielded by two families of plants and differing very much in appearance. The kind most widely distributed, the "true kola," which by some of the natives is called the "female kola," comes from the Sterculiaceæ; another variety, called by the author "false kola," is known among the negroes as simply "kola," or "male kola." Before the authors' researches only the "true" or "female" kola was known, and it had been ascertained to be yielded by the *Sterculia acuminata*, P. de Beauv. (*Cola acuminata*, R. Br.). To this Messrs. Heckel and Schlagdenhauffen are able now to add information concerning the "male" kola, hitherto unknown, and to give reasons for believing that various other species of *Sterculia*, besides *S. acuminata*, yield kola seeds.

Dealing first with "female" kola, the authors describe at length *Sterculia acuminata* from specimens, the description agreeing with Oliver's description of var. *a* (Fl. Trop. Af., i., 220.) According to the best information, the tree—which is from 30 to 60 feet high, and in general aspect resembles the chestnut—grows wild upon the western coast of Africa comprised between Sierra Leone and the Congo or Lower Guinea, reaching into the interior about five or six hundred miles, where it appears to follow the limits of the palm. Upon the eastern coast it appears to be unknown in places where it has not been introduced by the English. Dr. Schweinfurth, speaking of the country of the Nyams-Nyams, near lake Nyanza, says that among the imposing forms of vegetation a *Sterculia* of the kola kind predominates and is called locally "kokkorokou." In the country of the Momboutous (24° E. long., 3° N. lat.), too, upon asking for kola he was supplied with the fruit in its rose-colored envelope; but the only information he could obtain there concerning it was that the nuts were found in the country in the wild state and were called "nangoué" by the natives, who chewed slices of it whilst smoking. Karsten, in his "Flore de Colombie,"

[1] Abstract of a lengthy memoir read before the Union Scientifique des Pharmaciens de France (*Journ. Pharm. et de Chimie*, [5], vii, p. 553; viii, p. 81, 177.

describes the plant as growing wild in the moist hot woods near the southern coast of Venezuela, but the authors believe it was probably introduced there about the same time as it was introduced into Martinique, and that it was sown by African negroes, who brought it into those countries in the same manner as they are known to have introduced *S. cordifolia* for the sake of its delicious fruit. It has also been introduced successfully by the English into the East Indies, the Seychelles, Ceylon, Demerara, Dominica, Mauritius, Sidney and Zanzibar, and by the French recently at Guadelope, Cayenne, Cochin China and the Gaboon. In all these stations the kola tree flourishes best in moist lands at the sea-level, or a little above. At Sierra Leone some fine trees are found at an elevation of 200 or 300 metres, but not higher than that.

The kola tree commences to yield a crop about its fourth or fifth year, but it is not until about its tenth year that it is in full bearing. A single tree will then yield an average of 120 lbs. of seed annually. The flowering is nearly continuous after the tree reaches maturity, so that a large tree bears flowers and fruit at the same time. There are two collections; the June flowering yielding the fruit in October and November, and that of November and December in May and June. When the fruit is ripe it takes a brownish yellow color. In this condition dehiscence of the capsule commences along the ventral suture, exposing red and white seeds in the same shell. It is at this period that they are gathered. It has been stated that there exist two varieties of kola, one yielding exclusively red seeds and the other white; but the authors have been repeatedly assured that this is not the case, and that one and the same capsule may contain fifteen seeds varying considerably in size, white and red together, without the white being considered less ripe than the red. The carpels are from 6 to 9 centimetres long and 3 to 5 thick and the spongy pericarp is about 2 or 3 millimetres thick. As many as five or six ripe carpels may result from a single flower, and these may each contain from five to fifteen seeds; but sometimes carpels are met with containing only a single seed. The seeds removed from their envelope weigh, according to their development, from 5 to 25 or 28 grams. The epiderm is the principal site of the coloring matter, and beneath it the cotyledonary tissue consists of a mass of cells gorged with large starch granules comparable to potato starch. It is in these that the alkaloids caffeine and theobromine are found in the free state.

The collection is conducted with great care and is made by women. The seeds are removed from the husk and freed from the episperm. In order to maintain their value among the negroes it is necessary to keep them in a fit state and in good condition. They are, therefore, carefully picked over, all damaged and worm-eaten seeds being removed, and the sound seeds are then placed in large baskets, made of bark and lined with "bal" leaves (*Sterculia acuminata*, Car., or *S. heterophylla*, Beauv.?); the seeds are heaped up and then covered over with more "bal" leaves which, by their thickness, resistance and dimensions, contribute not a little to the preservation of the seeds by keeping them from contact with dry air. Packed in this manner the seeds can be transported considerable distances, remaining free from mould for about a month, during which time it is not necessary to submit them to any treatment in order to preserve them fresh beyond

keeping the "bal" leaves moist. But if it be desired to keep them beyond that time the operations of picking and re-packing have to be repeated about every thirty days; the seeds being washed in fresh water and fresh "bal" leaves placed in the baskets. The baskets usually contain about 2 cwts. of seeds. It is in this condition that "kola" is sent into Gambia and Goree, where the principal dealings in the seeds are carried on. In Gambia they are sold in the fresh state to merchants traveling with caravans into the interior, who dry them in the sun and reduce them to a fine powder, which is used, mixed with milk and honey, by the tribes of the interior to make a very agreeable, stimulating and nourishing beverage. It most frequently arrives at Sokota and Kouka in the Soudan and Timbuctoo, where large sales of the seeds are made, in the fresh condition; from the Soudan markets it is carried by caravans to Tripoli, and from Timbuctoo into Morocco. As might be expected the value of the Kola increases as it makes its way into the interior of Africa, and the authors state that some of the tribes furthest removed from the sea pay for the dry powder with an equal weight of gold dust. Kola plays an important part in the social life of many of the African tribes, and the authors mention some of the occasions upon which it is used in terms almost identical with those in a paper read at an evening meeting of the Pharmaceutical Society eighteen years ago (*Pharm. Journ.*, [2], vi., 450.) An interchange of white kola between two chiefs is indicative of friendship and peace, whilst the sending of red kola is an act of defiance. An offer of marriage is accompanied by a present of white kola for the mother of the lady; the return of white kola is equivalent to acceptance of the suit, whilst red means rejection. The absence of a supply of kola from among the marriage presents would endanger the whole arrangement. All the oaths are administered in the presence of kola seeds; the negro stretches out his hand over them whilst he swears and eats them afterwards.

Fresh kola is used as a masticatory, as is also the dried powder, by the tribes in the interior. When fresh the taste of the seeds is first sweet, then astringent and finally bitter. When the seeds become dry the bitterness diminishes, giving place to a sweeter flavor; but upon steeping them in water for a couple of days the original bitterness is nearly restored. Preference is given for mastication to seeds containing only two cotyledonary segments, it being asserted that they are less rough than those with four to six segments; but the authors did not find anything in their chemical examination to explain this preference. The practice of kola mastication, which is always accompanied by the swallowing of the saliva, does not injuriously affect the teeth, as is the case with the betel nut, but tends to render the gums firm, and exercises a tonic influence on the digestive organs. The seeds are reputed to clarify and render healthy the most foul waters, and to render tainted meat edible, and when chewed, either fresh or as a dry powder, and the saliva swallowed, to be a sure preventive against dysentery. They are also said, like *Erythroxylon Coca*, to possess the physiological property of enabling persons eating them to undergo prolonged exertion without fatigue, which is probably to be attributed to the caffeine they contain. Further it is said that kola exercises a favorable influence upon the liver, and that white people, living in those regions, who chew a

small quantity before meals escape constitutional changes due to affections of that organ. They are also believed by the negroes to have aphrodisiac properties. With respect to the assertion that the pulp or powder of the seeds thrown into foul water has the property of cleaning it, an experiment made by the authors would appear to show that any action in this direction would be due to the formation of a kind of mucilage, which would act mechanically like the white of an egg.

It has been pointed out that the name "kola" is applied in Africa indifferently to several Sterculaceous seeds other than those of the two varieties of *Coca acuminata*, although these are the most valued in the native markets. It is probable that the African plants capable of yielding seeds resembling the true kola are *Cola Duparquetiana*, Baill., *C. ficifolia*, Mast., *C. heterophylla*, Mast., *C. cordifolia*, Cax., and perhaps *Sterculia tomentosa*, Hend. But the authors think it doubtful whether these seeds contain caffeine, otherwise they would be as much sought after as the true kola.

In order to determine chemically the composition of kola seeds, the authors made a large number of experiments; the details fill many pages in the original paper. The dry seeds were first operated upon, and the process which appeared to give the best results was to exhaust the dried powder successively with chloroform and alcohol. The chloroform percolate was a yellowish liquid; this was evaporated to dryness, and the residue treated with water, which separated a fatty substance with an odor recalling that of cacao butter and entirely saponifiable by caustic potash. The yellow liquid upon concentration after filtration, deposited silky needles of caffeine, but when the solution was rapidly evaporated and the residue treated with water, ether or chloroform it no longer completely dissolved without using a considerable quantity and boiling, and upon such a solution cooling a small quantity of a compound crystallized out in microscopic prisms and octahedra which proved to be theobromine. The substances separated by chloroform from the dry nuts, were—caffeine, 2·348 per cent.; theobromine, 0·023 per cent.; tannin, 0·027 per cent.; fat, 0·583 per cent.

The kola powder was then dried and exhausted with alcohol. A mahogany colored extract was obtained which when treated with boiling water dissolved entirely, but the solution on cooling deposited a large quantity of coloring matter. The aqueous solution was precipitated with triplumbic acetate, the precipitate decomposed with sulphuretted hydrogen, and a liquid obtained, free from bitterness, containing a considerable quantity of a tannin giving an intense green color with persalts of iron, and a soluble coloring matter that formed lakes in contact with metallic solutions; the residue of the aqueous solution, after removal of excess of lead, was found to contain only glucose and a small quantity of fixed salts. The coloring matter deposited upon the cooling of the boiling water used in dissolving the alcoholic extract differed in its nature from the soluble coloring matter It appeared to be an oxidation product from the tannin and presented considerable analogy to cinchona red; in order to distinguish it, therefore, the authors have named it "kola red."

The composition of the alcoholic extract from the dry nuts (5·826 per cent.) was found to be—tannin, 1·591 per cent.; kola red, 1·290 per cent.; glucose, 2·875 per cent.; fixed salts 0·070 per cent.

The entire composition of the kola nut is compared by the authors with that of tea, coffee and cacao as follows:

	Cacao (Mitscherlich)	Coffee (Payen).	Tea Green (Peligot).	Tea Black (Peligot).	Kola (Authors').
Fat	53·00	13·00	0·28	.....	0·585
Proteid Matters	13·00	13·00	3·00	2·80	6·761
Theobromine	1·50	.....	.....	.....	0·023
Caffeine	.....	2·25	0·43	0·46	2·348
Essential Oil	0·04	0·003	0·79	0·60	undet.
Resin	.....	.....	2·22	3·64	.....
Sugar	0·5	15·50	.....	.....	2·875
Starch	.....				33·754
Gum	.....	.....	8·58	7·28	3·040
Cellulose	.....	34·00	17·08	26·18	29·831
Coloring Matters	.....	.....	17·24	19·20	2·561
Coloring Matters	5·00	.....	2·22	1·84	1·290
Extractive	.....	.....	22·80	19·88	.....
Tannin	.....	.....	17·80	12·88	1·618
Ash	3·60	6·697	5·56	5·24	3·395
Water	6·00	12·00	.....	.....	11·909
	100·00	100·00	100·00	100·00	100·00

These results, it is pointed out, differ somewhat from those obtained by Attfield (*Pharm. Journ.*, [2], vi, 457,) especially in the recognition of the presence of a second alkaloid and of tannin. The proportion of caffeine is higher than that observed in any coffee, or, except in rare instances, in tea, and exceeds that of theobromine in cacao. The alkaloid exists in kola, as in tea, uncombined, but in coffee, according to Payen, it is present as chlorogenate of potassium and caffeine. It is worth mentioning that the authors report the presence of a considerable proportion of caffeine and some theobromine in the pericarp, but the material at their disposal was too scanty for an exhaustive investigation in this direction. The leaves, wood and bark were also examined for alkaloid, but gave negative results. As in the case of coffee, kola undergoes a considerable loss of caffeine (three-fourths) during roasting, while the quantity of essential oil present is augmented.

Some experiments have been made with this kind of kola in the treatment of the atonic diarrhœa to which Europeans are frequently liable in tropical countries. The results have been fairly satisfactory, and through the efforts of M. Heckel the medicine has been supplied to some French colonial stations for a systematic trial. The preparations used are an aqueous extract, an alcoholic extract and a wine. The alcoholic extract is

made by exhausting fresh kola with 5 parts of 60° alcohol and the wine by macerating the same proportions of kola in a sweet white wine during a fortnight. Neither of these preparations, however, completely exhaust the kola, at least as far as the caffeine is concerned. The preparation of an aqueous extract presents considerable difficulty in consequence of the quantity of starch, which forms an unmanageable magma.

Concerning the "male kola" or "kola bitter," as before stated, nothing definite was known, and as recently as the year 1882, it was referred erroneously to a species of *Sterculia*. In the "Flora of Tropical Africa," Oliver says: "The kola bitter of Fernando-Po is the product of trees belonging to the Guttiferæ. The authors were led by this remark to attempt to obtain from various parts of the eastern coast specimens of the plant yielding "kola bitter," and although the flowers did not reach them they received specimens of the branches, leaves and fruits, together with a sufficient quantity of seeds to allow of a complete analysis being made. All the specimens received from various places corresponded in their characters, and showed that the kola bitter is the produce of a single Guttiferous species and not of several. From the material at their disposal the authors refer it to a new species, *Garcinia Kola*, Heckel.[1] The plant is described as a tree of variable aspect, 10 to 20 feet in height, bearing towards the base of the branches large opposite leaves (12 in. long by 7 in. broad,) with short petioles, whilst at the extremity of the branches the leaves are much smaller (5 in. by 2 in.) The leaves are oval, slightly dilated at the base, mucronate at the apex, without stipules, full green on the upper surface and greyish underneath. The fruit is a berry the size of an apple, with a rugose epiderm covered entirely with rough hairs. It presents three or four divisions, each containing a large oval cuneiform seed, rounded on the external and angular on the internal face; the seeds are covered with an abundant sourish yellowish pulp, constituting a true arillus. The fruit has at the base the persistent calyx still adherent to the peduncle, and sometimes the persistent corolla, and at the apex the persistent stigma. The plant is reported to occur all along the eastern coast of Africa and of Senegal, intermixed with the *Sterculia acuminata*, flourishing under the same conditions, but less widely distributed. In its known characters the plant would appear to be closely allied with *Garcinia Morella*, which, however, is essentially an Asiatic species. The seeds present one convex and two plane surfaces, the former being towards the circumference of the fruit. They are covered by an apricot-yellow episperm, below which is a large yellowish-white macropodous embryo, devoid of cotyledons, and with numerous depressions on its surface. The tissue is denser and closer than that of true kola and crackles under the teeth; it consists of a compact mass of very homogeneous cellular tissue, interspersed here and there with laticiferous vessels of varying size containing resin, the cells constituting which are filled with starch granules larger than those occuring in true kola.

[1] The plant yielding "bitter kola" was identified as a species of *Garcinia* by Dr. Maxwell T. Masters eight years ago, and was partly described and the fruit figured by him in the *Journal of Botany* for March, 1875.—Editor *Phar. Jour.*, February 2, p. 610.

Upon chewing these seeds a strongly bitter, astringent and yet aromatic taste is perceptible, which is quite different from that of true kola, and approaches in its aromatic flavor that of green coffee; it is this aromatic flavor that is esteemed by the negroes. It is worthy of remark that although the use of these seeds does not produce any notable stimulant effects or ward off fatigue, they are as much sought after and fetch nearly as high a price on the eastern coast as the true kola. In the interior, however, they are unknown. The authors are of opinion that these seeds owe their properties to the resin they contain, which is slightly stimulant. By the negroes they are thought to exercise an aphrodisiac action, which the authors consider doubtful, and as a masticatory, they are said to be a valuable remedy for colds.

An examination of fresh male kola nuts for caffeine gave negative results, the chloroform, ether and alcoholic percolates being all free from alkaloid. Besides coloring matter, tannin and glucose, two resins were separated. One of these was brown, hygrometric and soluble in ether and melted at the temperature of the water-bath; the other was yellowish-white, soluble in ether, alcohol, acetone and acetic acid, insoluble in carbon bisulphide or petroleum spirit, and had a high melting point.

A large proportion of the paper is devoted to a study of the constitution of caffeine and several of its derivatives, in reference to the identification of the alkaloidal substances obtained by the authors from the female kola.—*Phar. Jour. and Trans.*, Jan. 26, 1884, p. 586.

MINUTES OF THE PHARMACEUTICAL MEETING.

PHILADELPHIA, February 19, 1884.

In the absence of the President Mr. Alonzo Robbins was called to the chair. The minutes of the last meeting were read and approved.

Professor Maisch presented the report of the Chief Signal Officer of the War Department for 1881; the Year Book of Pharmacy for 1883; the Calendar of the Pharmaceutical Society of Great Britain, 1884; a monograph, by Prof. Hamberg, upon the physiological effects of the odorous volatile principles of whiskey, in the Swedish language; and a syllabus of a course of lectures on Pharmacy by Prof. E. L. Patch, of Boston, Mass. These books were all referred to the Librarian to be entered on the catalogue and arranged in the library.

Mr. Gustavus Pile exhibited some specimens of finely drawn aluminium wire, suitable for small weights each of the pieces weighed one centigramme.

Dr. Miller presented a specimen of gum siftings, which has been offered for sale for tobacconist's uses; it is much darker and inferior than that usually sold for such purposes; the very greatly increased price of all varieties of gum, consequent upon the war in Egypt, has probably induced vendors to offer low grades in hopes of realizing on them.

Mr. Pile asked if oil of limes was an article of merchandise and attain-

able in commerce. Dr. Miller said it was sold under the name of oil of limetta.

Professor Trimble exhibited the outer shells of the coffee bean, from Liberia, that had been handed to him to examine for caffeine, and hoped to be able to report on it at a future meeting.

There being no further business, on motion, adjourned.

T. S. WIEGAND, *Registrar.*

EDITORIAL DEPARTMENT.

UNOFFICINAL FORMULAS.—We have, in former volumes, frequently drawn the attention of our readers to the inconveniencies arising from the use by pharmacists of preparations made according to unpublished processes, and from prescribing by physicians of preparations of which they know little more than the names. These inconveniences are so generally known and acknowledged as evils, that attempts have been frequently made in various localities to secure uniformity in the dispensing of such preparations. One of the first measures undertaken by the American Pharmaceutical Association after its organization was the collection of unofficinal formulas in local use. This was suggested by Mr. John Meakim, of New York, and in 1853, on motion of Mr. Joseph Laidley, of Richmond, Va., the Executive Committee undertook the collection of such formulas; but not receiving any aid from others, it was deemed advisable in 1856 to appoint a special committee of ten, which was subsequently increased to fourteen, with Mr. Meakim as chairman. This committee collected a considerable number of formulas, which were published in the Proceedings, 1857 and 1858. A number of unofficinal formulas were also reported by Mr. J. F. Hancock, of Baltimore, in 1874.

While the "elixir nuisance" was at its height, committees were appointed and presented formulas at the meetings held in 1873 and 1875, and by special vote of the Association, these formulas were recommended for general use and were also officially communicated to the various medical societies in the United States with the suggestion that physicians if prescribing elixirs at all, make use of the formulas recommended. This action did not remove the evil, but it invested at least these formulas with a certain authoritativeness, capable of producing greater uniformity in a set of preparations, nearly all of which, it seems to us, should be left to extemporaneous prescription.

But as long as physicians can be induced to resort to other than pharmacopœial preparations, the necessity will also exist to devise formulas for such, no matter how transient or ephemeral their use, or how slight their medicinal value may be. This necessity exists everywhere; hence the compilation of numerous formularies, several of which are recognized in European countries as authorities in such cases where the pharmacopœia does not supply the want.

At the last meeting of the American Pharmaceutical Association a motion made by Mr. J. W. Colcord, of Lynn, Mass., was carried and a committee

on unofficinal formulas was appointed. This committee has divided the necessary labor among its members, and it is to be hoped that by this division of labor formulas may be secured which may be used by the pharmacists in all parts of the country, and which may, at least in a measure, do away with the ready-made medicines of the present market. To accomplish as much good as possible, it is desirable that the committee should be aided by all interested. Formulas may be sent to the chairman, Mr. Colcord, or if on special subjects, may be communicated to the sub-committee having that subject in charge. These committees are as follows: *On elixirs.*—J. T. Shinn, Philadelphia; W. M. Searby, San Francisco; M. W. Alexander, St. Louis; N. H. Jennings, Baltimore, and J. D. Wells, Cincinnati. *On ointments.*—S. A. D. Sheppard, Boston. *On fluid extracts.*—Ewen McIntyre, New York. *On emulsions.*—Chas. Becker, Washington, D. C. *On pills.*—C. L. Keppler, New Orleans, and R. H. Cowdrey, Chicago. *On wines.*—J. W. Colcord, Lynn, Mass.

A PROPOSED NATIONAL PHARMACOPŒIA.—The "Journal of the American Medical Association," January 26, 1884, contains the text of the following bill, which was introduced by Mr. Randall in the House of Representatives, January 8th, read twice, referred to the Committee on Ways and Means, and ordered to be printed:

A BILL TO PREPARE AND PUBLISH A NATIONAL PHARMACOPŒIA FOR THE UNITED STATES.

Be it enacted by the Senate and House of Representatives of the United States of America, in Congress assembled, That the Secretary of the Treasury shall, as soon as practicable, detail two officers of the Marine Hospital Service, and the Secretary of War shall detail two officers of the Medical Staff of the Army, and the Secretary of the Navy shall detail two officers of the Medical Staff of the Navy, for the duty of compiling and preparing a Pharmacopœia, which shall be known as the "National Pharmacopœia of the United States of America," and shall be held and accepted as the standard for the purveying, compounding and dispensing of drugs or medicinal agents, and shall be taken as authority in the Treasury Department on all questions arising under the tariff laws of the United States with regard to the nomenclature, description and purity of drugs or remedial agents, and shall further be received as evidence in the United States courts. And the matters contained in the said Pharmacopœia shall be free for use by all authors and commentators for the benefit of the medical and pharmaceutical professions, and of the community at large; and it shall not be lawful for any one to reprint and publish the said Pharmacopœia as a whole.

SEC. 2. That the medical officers detailed as above provided shall invite the American Medical Association and the American Pharmaceutical Association, at their next annual meetings, to form committees of not more than three members from each of the said Associations, which committees, if so appointed, may co-operate with the above-named medical officers in the preparation of the said Pharmacopœia, forming a board which shall have power from time to time to add to its number as may in its judgment be necessary, and which shall elect a chairman and a secretary, and adopt such rules as it shall see fit for the expediting and perfecting of the said

Pharmacopœia, which, when completed, shall be printed under the supervision of the said board; and an edition of not less than five thousand copies shall be printed for use in the several Departments of the Government of the United States; and copies may be furnished to private persons in accordance with the provisions of section thirty-eight hundred and nine of the Revised Statutes.

SEC. 3. That, for the purpose of defraying the necessary expenses of preparing the said Pharmacopœia, the sum of five thousand dollars is hereby appropriated out of any moneys in the Treasury not otherwise appropriated, and the same shall be disbursed under regulations to be prescribed by the Secretary of the Treasury.

SEC. 4. That the said Pharmacopœia shall be revised once in ten years, upon the plan embodied in this Act.

Without intending for the present to enter into details, we merely wish to point out what, in our opinion, would be the most important result of a law recognizing a Pharmacopœia for the United States. We find this in the legal establishment of standards for medicines imported or sold under certain titles (those of the Pharmacopœia).

Regarding the plan for the formation of a committee for preparing such a work, it will be observed that three distinct Government Departments are to be represented therein, each by two medical officers. Excepting the importations of medicines, these Departments are directly interested, in the first place, only to the extent of the supplies for their hospitals, and as for all hospitals the regular supplies furnished are limited in variety, but the special supplies may embrace any article of medicinal use. In this respect, these medical officers are in a similar position as all other physicians who, as a rule, employ only a very limited number of drugs; but the former, from the occasional change of their sphere of activity, have the best opportunities of familiarizing themselves with the remedies used in different sections of the country; and, in addition to this, according to the proposed law, they are to invite the co-operation of the National Medical and Pharmaceutical Associations. It would therefore seem as if by this plan the real wants of all parts of the country could well and properly be ascertained and taken care of.

The experience of all countries have shown that the real work in preparing a Pharmacopœia must be done by pharmacists, while it belongs to the special province of the physician to designate the drugs and preparations which should be admitted in such a work, and of the galenical preparations also their relation to the drug from which they are made. Unfortunately, pharmacy, as such, is not recognized in the different Government Departments, and we fear that it will be a long time before it will be accorded that position which it holds in France. On the part of these Departments, therefore, pharmacists cannot be detailed for such a duty; but provision has been made that the board may "add to its number as in its judgment may be necessary," and, if this power is judiciously exercised, it will doubtless be in the direction of adding pharmacists and other experts, with the view of making the contemplated work as useful and reliable as possible.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

The Medical Directory of Philadelphia for 1884. Edited by Samuel B. Hoppin, M. D. Philadelphia: P. Blakiston, Son & Co. 8vo, pp. 205. Price $1.50.

The Directory contains alphabetical lists and street lists of the regular, homœopathic and eclectic physicians, with the dates of their diplomas; also, lists of persons practising medicine without diplomas; alphabetical and street lists of apothecaries; medical and pharmaceutical colleges; medical societies, hospitals and other institutions and societies; also, the laws of Pennsylvania referring to the practice of medicine. The book has evidently been prepared with great care.

Proceedings of the Convention of Druggists and of the First Annual Meeting of the Michigan State Pharmaceutical Association, held at Lansing, Nov. 14 and 15, 1883. Muskegon, Mich.: Jacob Jesson, Secretary. 8vo, pp. 67.

In May, 1874, a State Pharmaceutical Association was organized in Detroit, and subsequently one or two meetings were held, after which the Association went out of existence. We are pleased to note now the initial meeting resulting in the formation of a new Association, which, to judge from the membership, and from the work done, gives promise of activity and usefulness in the future. The officers for the first year are: Frank Wells, Lansing, President. Isaac Watts, Grand Rapids; I. L. H. Dodds, Buchanan, and W. B. Wilson, Muskegon, Vice-Presidents. Jacob Jesson, Muskegon, Permanent Secretary. A. W. Allen, Detroit, Assistant Secretary; and Wm. Dupont, Detroit, Treasurer. The next meeting will be held in Detroit on the Second Tuesday of September, 1884.

Proceedings of the Fourth Annual Meeting of the Iowa State Pharmaceutical Association, held in Davenport, Tuesday and Wednesday, May 1st and 2d, 1883. Iowa City, Ia. 8vo, pp. 96.

A brief account of this meeting will be found on page 334 of our last volume. The pamphlet contains a portrait of the former President of the Association, Mr. A. R. Townsend.

Fifty-first Annual Report of the Managers of the Pennsylvania Institution for the Instruction of the Blind. To which is appended an Account of the Celebration of the Semi-Centennial Anniversary of the Foundation of the Institution. 8vo, pp. 40.

Proceedings of the Naval Medical Society. Washington, D. C.

The greater portion of the pamphlet before us is taken up with remarks on yellow fever.

The Absence of Design in Nature. A lecture delivered before the Philosophical Society of Chicago. By Prof. H. D. Garrison.